HIGH HAZARD LOCATION STUDY

FOR

RAVALLI COUNTY, MONTANA

DCA PROJECT NO. 80-06-01-2

PREPARED BY

HENNINGSON, DURHAM & RICHARDSON INC.

HELENA, MONTANA

HDR PROJECT NO. 27-01-40

NOVEMBER 1980

WLP 99-358649

HDR

Henningson, Durham & Richardson, Inc. of Montana

330 Professional Center
2225 Eleventh Ave., Suite 17
Helena, MT 59601
(406) 442-7400

December 5, 1980

Ravalli County Road Department
330 East Fairgrounds Road
Hamilton, Montana 59840

Re: High Hazard Location Study
DCA Project No. 80-06-01-2
HDR Project No. 27-01-40

Dear Mr. Unrue:

In accordance with our engineering agreement dated September 9, 1980, we are submitting herein the Final Report for the subject project. Seven copies are included.

On behalf of HDR and, in particular, Ken Anderson and myself, we wish to express our sincere appreciation for the opportunity to have been of service to Ravalli County. We are especially grateful for the dedicated effort and cooperation extended by yourself and Mr. Harry Lauer, Highway Safety Division of the Department of Community Affairs.

We have enjoyed working with you and are readily available for any other services you may require. As you proceed with the recommendations contained in the Report, please feel free to call upon us if we can be of some assistance.

Respectfully submitted,

HENNINGSON, DURHAM & RICHARDSON, INC.

D. K. Hudson

D. K. HUDSON, P.E.
Vice President

MONTANA
DAVID K. HUDSON 4874 E
REGISTERED PROFESSIONAL ENGINEER

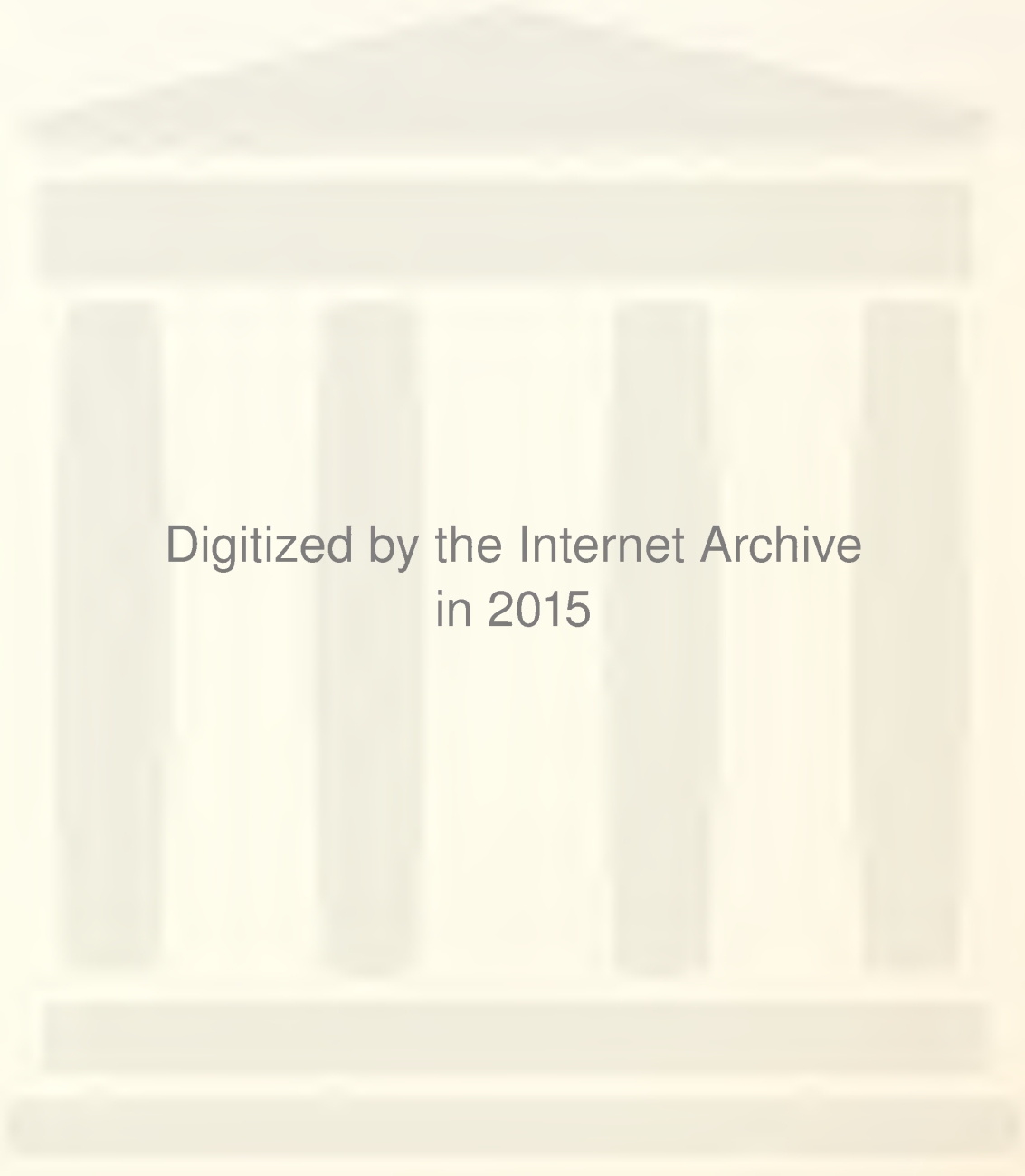
Kenneth L Anderson

KENNETH L. ANDERSON
Project Manager

ACKNOWLEDGEMENT

We appreciate the opportunity to work with Ravalli County on this project, and we sincerely hope that this report will be a useful guide toward the improvement of hazardous road conditions in the County.

The cooperation extended us by Ravalli County officials and employees was greatly appreciated. We would like to thank Mr. Jay Unrue and Mr. Dick Krasovich for their assistance. We would also like to thank Mr. Harry Lauer of the Department of Community Affairs, Highway Safety Division, for his cooperation and assistance throughout this study.



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I. INTRODUCTION

The purpose of this report is to evaluate 13 hazardous road locations in Ravalli County and to prepare recommendations for improvements.

The 13 sites were chosen by representatives of Ravalli County and the Montana Department of Community Affairs, Highway Safety Division. Each site was chosen either because it had experienced a relatively high number of accidents over the past four years or because it was considered to be hazardous despite not having a significant accident history.

Based upon the evaluation, a priority list was developed and recommendations for implementation are presented. In additon, this report contains a recommended procedure for periodically updating the priority list.

II. SUMMARY

The 13 sites were evaluated under procedures contained in the Federal Highway Administration Report No. FHWA-RD-77-83. Each site was independently evaluated with respect to seven indicators and based upon these elements a Hazardousness Index (HI) was calculated for each. These HI values are used as a means of comparing the relative hazardousness of each site.

Following the evaluation process, recommendations for improvements were formulated, and cost estimates were prepared. A priority list was developed based upon both the relative hazardousness and the cost of improvements at each site. This priority list is shown in Table 1.

The priority list is the recommended order of implementation of the improvements described in this report. It is, however, only the first step in an ongoing process of locating, evaluating and improving hazardous locations throughout the County. To assist the County in future work, this report contains a recommended procedure for future analysis of hazardous locations and periodic updating of the priority list.

Section VI contains a detailed evaluation of each site including: description, accident history, collision diagrams, analysis of hazardous features and improvement diagrams.

In most cases, low-cost improvements are recommended in an effort to present solutions within the short-term funding capabilities of the County. However, at some of the sites the hazardous features and the volume of traffic warranted higher cost improvements which are presented. Recognizing that implementation of the higher cost improvements could be substantially delayed due to funding problems, interim recommendations are also presented at those locations.

TABLE 1
RAVALLI COUNTY
PRIORITY LIST*

PRIORITY	SITE NO.	AND DESCRIPTION	PRIORITY INDEX	HAZARD INDEX	COST FACTOR	COST OF IMPROVEMENTS
1	9	East End of Pine Hollow Road	62	62	63	$ 440
2	5**	Int. Golf Course Rd. & Old Grantsdale Rd.	59	47	96	$ 1,320
2	11	Middle Burnt Fork Road	59	50	85	$ 540
4	10	Int. Mid. Burnt Fork Rd. & Logan Lane	56	44	93	$ 630
4	15**	Int. Ricketts Rd. & Blodgett Camp Rd.	56	43	96	$ 1,100
6	1	Jct. Old Darby Road & Lake Como Rd.	55	58	45	$ 720
7	8**	Victor Crossing Road	54	55	48	$ 720
8	2	Upper End of Lost Horse Road	51	55	65	$ 360
8	3	Jct. Sleeping Child Rd. & Skalkaho Rd.	51	36	96	$ 810
10	13	Int. Tie Chute Lane & Old U.S. 93	50	36	83	$ 810
10	6**	Int. Bowman Rd. & Ricketts Rd.	50	49	51	$ 3,900
12	4	East End of Sleeping Child Rd.	36	45	10	$ 590
13	14**	Int. West Side Rd. & West Bridge Rd.	30	13	83	$ 1,230

** High-cost, long-term improvements are shown on Table 2

III METHODOLOGY

III. METHODOLOGY

A. BACKGROUND

Identifying and evaluating hazardous locations on a road system is a problem faced by virtually every city, county and state agency or jurisdiction that has responsibility for constructing and maintaining roads. Equally difficult is establishing priorities for locations identified as needing improvements. Ravalli County is one of those agencies.

In an effort to assit local agencies, the Federal Highway Administration has developed a procedure for identifying and ranking hazardous locations that is both meaningful and easily determined. The procedure is described in the report FHWA-RD-77-83. Ravalli County has initiated a program of improving hazardous locations on its road system and has selected the methodology prescribed by the FHWA as the basis for their program.

B. HAZARDOUSNESS INDEX

A Hazardousness Index (HI) is calculated independently for each site. Up to nine indicators or parameters can be used. For each indicator, a value is calcualted which is between 0 and 100, with 0 signifying no hazard and 100 signifying most hazardous. Each indicator value has an assigned weight. The sum of the indicator values times their respective weights is defined as the Hazardousness Index (HI) for that particular site.

The nine indicator values recommended by FHWA are the following:

- Number of Accidents
- Accident Rate
- Accident Severity
- Volume/Capacity Ratio
- Sight Distance
- Erratic Maneuver
- Traffic Conflicts
- Driver Expectancy
- Information System Deficiencies

As directed by Ravalli County, the indicators Erratic Maneuvers and Traffic Conflicts are not used in this study.

Each site is then assigned a Cost Factor (CF) which is based upon a combination of the cost of the improvements and the exposure rate. The exposure rate is the number of vehicles which are expected to be exposed to that particular hazard over the next five years. The CF is also a numerical value ranging from 0 to 100.

A final Priority Index (PI) for each site is derived by combining its HI and CF. A ranking is established directly from the PI's for the various sites, with the location having the highest PI being assigned the highest priority.

The methods of calculating a Hazardousness Index, Cost Factor and Priority Index are described in the following sections.

The procedure is based upon the principle that each location will be assigned a numerical value from 0 to 100 which indicates that location's degree of hazardousness. The higher the value, the more hazardous the location. That value is defined as its Hazardousness Index (HI).

After a site is identified as hazardous, the type of improvements needed to reduce or eliminate the hazard are determined and cost estimates prepared.

If fewer than nine indicators are used for any site, the HI is normalized based upon the number of indicator values actually used and their weights.

Figure 1 is a sample of the form used to determine HI's.

The method of calculating a value for each of the indicators is precisely defined. Even the indicators Driver Expectancy and Information System Deficiencies, which are referred to as subjective indicators, have clear-cut guidelines for determining a value. The use of this type of a systematic procedure allows for a meaningful comparison of sites even if they are evaluated at different times by different persons.

C. INDICATORS

This section contains a description of each of the indicators used in this study. For the most part, the indicators used are precisely the same as recommended by FHWA; however, in a few instances, some adjustments were made in order to adapt the procedure to the available data and to local conditions.

The seven indicators used in the evaluation are:

Number of Accidents

This is the average number of accidents per year over the four-year period from 1976 through 1979. The FHWA report recommends the use of a three-year period, but good data was available for four years and because of the low total number of accidents, the use of the longer period will help to "level out" the random accidents which occur.

The use of a period longer than three years is appropriate as long as conditions at a site have not changed during the period. If physical changes have been made at any site which have altered it's hazardousness, then only accidents which have occurred since the change was made should be considered.

This indicator can be misleading on low volume roads. It should only be used in conjunction with the indicator Accident Rate to provide a valid comparison of different sites.

Figure 1

DETERMINATION OF HAZARDOUSNESS INDEX

Site Number SAMPLE Date _____

Type _____

Indicator	Date Value		Indicator Value		Weight		Partial H.I.'s
Number of Accidents	_____	acc/yr	_____	x	0.145	=	_____
Accident Rate	_____	acc/MEV	_____	x	0.199	=	_____
Accident Severity	_____	dollars	_____	x	0.169	=	_____
Volume/Capacity Ratio	_____		_____	x	0.073	=	_____
Sight Distance Ratio	_____	(wt.avg.)	_____	x	0.066	=	_____
Traffic Conflict	_____	conf/hr.)	_____	x	0.053	=	_____
Erratic Maneuvers	_____	e.m./hr.	_____	x	0.061	=	_____
Driver Expectancy	_____	(wt.avg.)	_____	x	0.132	=	_____
Info. System Deficiencies	_____	(wt.avg.)	_____	x	0.102	=	_____
Sums:					_____ *		_____

$$H.I. = \frac{\text{Sum of Partial H.I.'s}}{\text{Sum of Applicable Weights}} = \_\_\_\_\_ = \_\_\_\_\_$$

Relative Strength of Evaluation:

Sum of Applicable Weights x 100 = _____%

*Do not include weights for indicators not used at this site.

Accident Rate

This indicator is the average number of accidents per million vehicles entering the site. This parameter is included in an effort to be able to compare sites with widely varying volumes of traffic where the accident totals alone do not give a true indication of hazardousness.

Accident Severity

This factor was developed to differentiate between types of accidents based upon their severity. It recognizes that a low speed collision in a congested urban area will generally be far less severe than a high speed collision at the intersection of two rural highways. The first two indicators do not distinguish between the two, thus ignoring an important consideration.

In order to normalize accident severity, FHWA developed a "Relative Severity Index" to be applied to each accident. This index was used in this study without modification.

Volume/Capacity Ratio

The parameter is included to account for the increase in hazardousness of a particular location as traffic and, correspondingly, congestion increases and approaches capacity. On low volume roads this parameter becomes relatively insignificant since capacity is never approached even during peak hours and congestion is not a contributing factor in hazardousness.

Sight Distance

This parameter is based upon a scale which relates actual sight distance to the minimum sight distance required for safe stopping. This parameter can be used along with the two subjective indicators to evaluate a location which does not have a significant number of recorded accidents, but which is perceived as potentially hazardous and merits study and possible corrective action.

Driver Expectancy

This is one of the two subjective indicators. It "relates to the readiness of the driver to respond to events, situations, or the presentation of information." It is primarily a function of the driver's immediate past experience and the expectancy that the approaching roadway will have characteristics similar to what has just preceded. For example, a driver is less likely to expect, and thus be ready to properly respond to, a sharp curve at the end of a long straight section of roadway than as part of a winding road.

This indicator, along with the indicator, Information System Deficiencies, provides a very good indication of the hazardousness of a location which may not have a significant number of recorded accidents. They help

account for the fact that a particular location, through pure luck or good fortune, may have had few if any accidents despite being very hazardous.

Information System Deficiencies

This is the second of the subjective indicators. It is an indicator of the ability of the information system to adequately inform the driver of the condition of the approaching roadway segment and of the decisions and maneuvers he will have to make. A good information system will inform the driver that a hazard exists far enough in advance so that adequate adjustments can be made in a safe manner.

At locations with no signing, sites were not automatically given a rating of 100. Each site was examined to see if signing was appropriate to distinguish it from other road segments or intersections in the vicinity. If so, the definitions and verbal descriptions were applied; for example, an indicator value of 67 is definied as "very hazardous" or "critical," and a value of 33 is definied as "hazardous". Therefore, if the complete absence of signing made a site "hazardous" but not "very hazardous", its indicator value would be between 33 and 67.

D. COST FACTOR

In order to develop a priority ranking it is necessary to calculate a Cost Factor (CF) for each site. The Cost Factor is calculated after recommended improvements have been determined and cost estimates prepared. The method of determining the type of improvement which is warranted at each site is discussed in Section IV.

The Cost Factor is based upon a ratio of the cost of the improvement to the exposure rate, which is the number of vehicles which will be exposed to the site over the next five years. The Cost Factor ranges from 10 to 100 as shown in Figure 2.

The use of this factor is based upon the premise that consideration should be given to the number of persons who will be exposed to a particular hazard in the future. Presumably, a site with a slightly lower HI, but which is expected to have a substantially larger volume of traffic, should receive a higher priority. The use of a cost factor accomplishes this. However, the weighting in the formula prevents a "very hazardous" location from dropping too low on the priority list simply because of a low projected volume of traffic.

For this study two separate Cost Factors are considered. The first is based upon short-term or interim improvements (Figure 2). The second is based upon long-term, high cost improvements which are recommended for five of the sites (Figure 3).

This dual ranking was done for two reasons. First of all, due to the relatively small amount of funds available for improvements, the entire budget would be spent on one site if it received a top ranking and the 12 others would remain unimproved. Unless one site stood out as extremely hazardous, warranting immediate attention regardless of cost, it would be difficult to justify that course of action.

Figure 2
DETERMINATION OF COST FACTOR
Low Cost and Interim Improvements

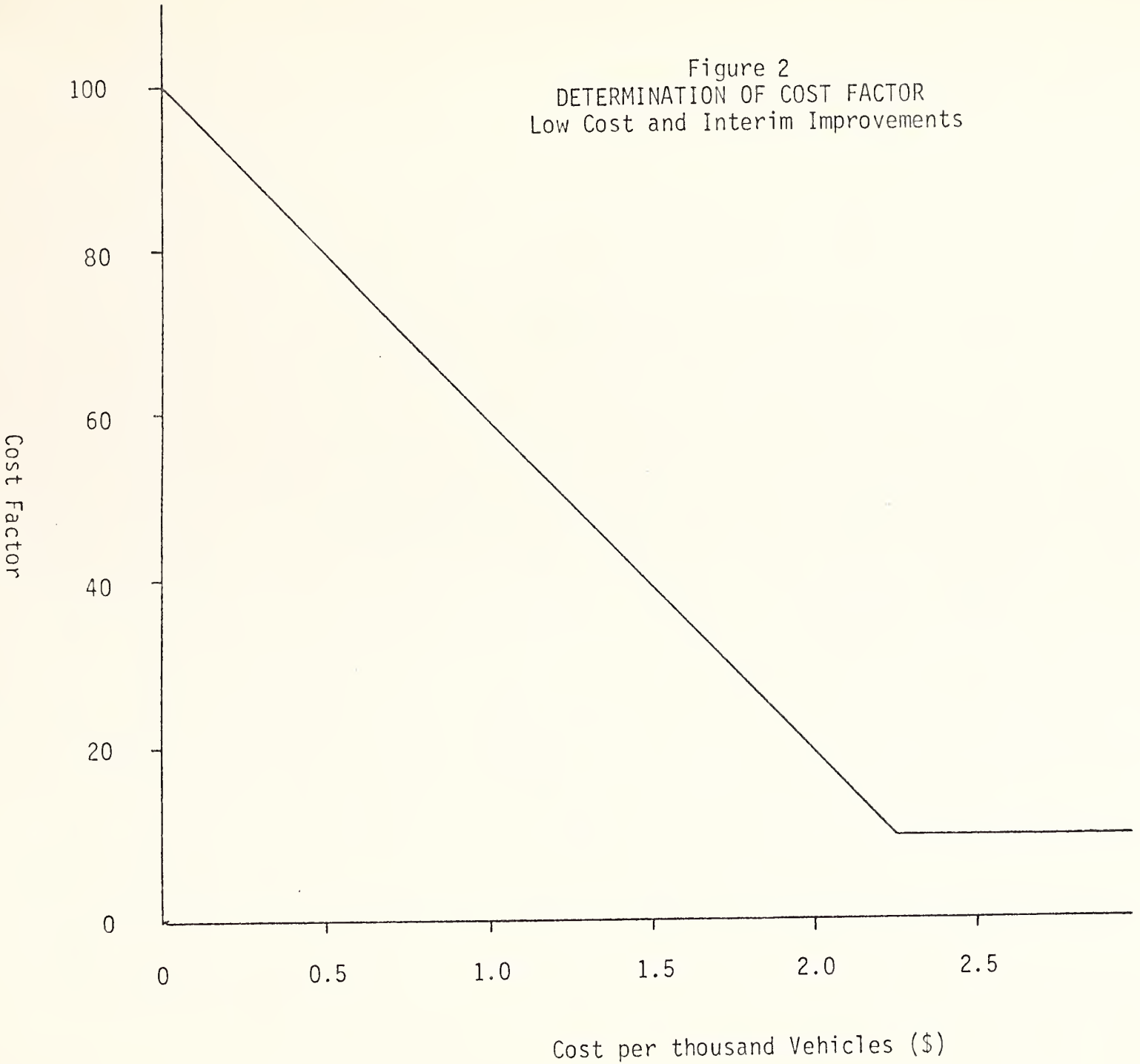
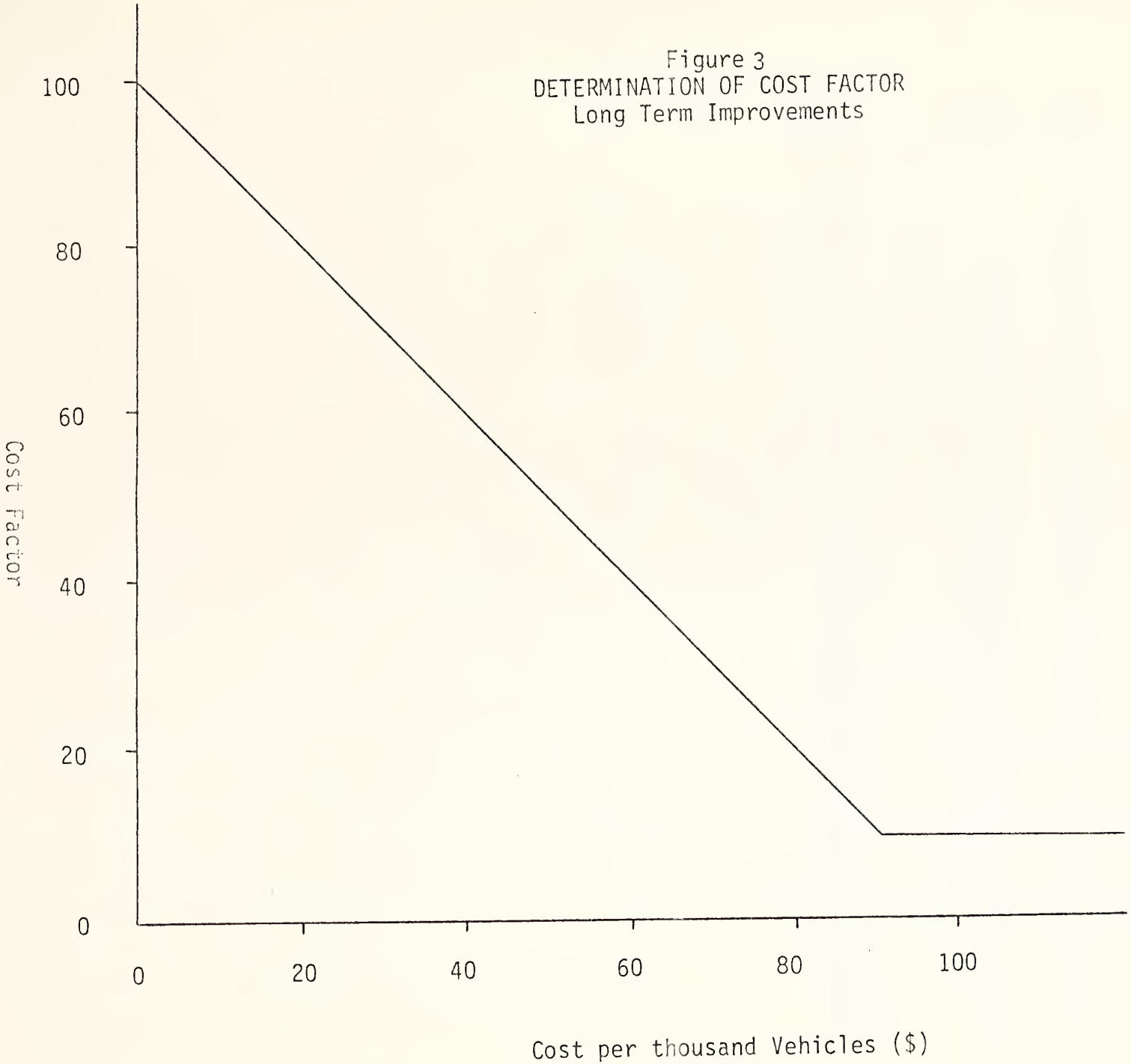


Figure 3
DETERMINATION OF COST FACTOR
Long Term Improvements



The second reason is that if the scale for calculating the Cost Factor was broad enough to include the high-cost improvements, all of the low-cost improvements would receive very high Cost Factors of approximately the same value.

Cost estimate information utilized for developing improvement costs was first half 1980 unit bid tabulations by the Montana Department of Highways with an inflation adjustment factor to late 1980. Labor and equipment related costs were based on an estimated time required to accomplish the specific work task. This methodology was used for both the short-term or interim improvements and the long-term improvements.

E. PRIORITY LIST

The Priority List is the final ranking of projects and the recommended order of implementation.

Each site is assigned a Priority Index (PI) based upon its Hazardousness Index (HI) and its Cost Factor (CF) according to the formula:

$$PI = .75\ HI + .25\ CF$$

The Priority List is contained in Table 1 for the low-cost and interim improvements. The Priority List for the long-term, high-cost improvements is contained in Table 2.

TABLE 2
RAVALLI COUNTY
PRIORITY LIST FOR LONG-TERM IMPROVEMENTS

PRIORITY	SITE NO.	AND DESCRIPTION	PRIORITY INDEX	HAZARD INDEX	COST FACTOR	COST OF IMPROVEMENTS
1	6	Int. Bowman Rd. & Ricketts Rd.	61	49	95	$ 12,840
2	5	Int. Golf Course Rd. & Old Grantsdale Rd.	59	47	97	$ 42,460
3	15	Int. Ricketts Rd. & Blodgett Camp Rd.	56	43	94	$ 32,340
4	8	Victor Crossing Road	44	55	10	$ 202,740
5	14	Int. West Side Rd. & West Bridge Rd.	34	13	96	$ 10,600

IV PROCEDURE

IV. PROCEDURE

A SITE SELECTION

The 13 sites were chosen by representatives of Ravalli County and the Montana Department of Community Affairs, Highway Safety Division. They were chosen along the guidelines suggested by FHWA, either because they had experienced a relatively high number of accidents over the past four years or because they were considered to be hazardous despite not having a significant number of recorded accidents.

B ORIENTATION

Prior to beginning the study, Mr. Jay Unrue of Ravalli County conducted a tour of the sites; members of the investigative team and Mr. Harry Lauer of the Montana Department of Community Affairs, Highway Safety Division accompanied Mr. Unrue. Background information on each site was provided, and accident data was reviewed. Based on this initial tour, two of the originally selected sites were deleted; two replacement sites were then selected by representatives of Ravalli County.

C FIELD INVESTIGATION

A team of investigators visited each site in order to obtain all necessary site specific data including all geometrics and grades, signing, sight distances, and traffic counts. Driving characteristics were observed and spot speed checks were made to determine the typical driving patterns at each site. Six sites were visited at night to determine the visibility of signing and the roadway path as seen through the eyes of the driver under night-time conditions.

Based upon the data collected furing the on-site ivnestigations, location diagrams were drawn showing all pertinent information at each site.

Traffic counts were also obtained by the team of investigators for seven of the sites during the field investigation process. Representatives of Ravalli County obtained traffic counts at five other sites, and traffic count was estimated for the final site, which is currently closed to traffic because of structural repairs required on the bridge.

D SUBJECTIVE INDICATORS

The "subjective" indicators, Driver Expectancy and Information System Deficiencies, were obtained at a later date. A three person team visited each site and the ratings were obtained using the procedures contained in FHWA-RD-77-83. The three persons on the team had not participated in the field study or selection of sites and were chosen since they could objectively evaluate the sites as an unfamiliar driver would observe them. Two of the team members were not residents of Ravalli County and were totally unfamiliar with the sites. The third team member was a resident of Ravalli County, and was chosen to reflect the local driver's viewpoint. The team was not informed of the accident history at any site in order to avoid an unconscious tendency to give a hazardous rating to a site with a large number of accidents.

The guidelines for determining values for the "subjective indicator" are contained in the Appendix.

E ACCIDENT ANALYSIS

In order to obtain a clear understanding of the accident history at each site, the accident reports were examined in detail and collision diagrams were prepared. At some of the sites patterns for accidents were readily apparent and the causes were easily determined. At most of the sites, however, the number of accidents was so low that patterns could not be established. At those locations the indicator values of sight distance, driver expectancy, and information system deficiencies were invaluable in determining the hazardous features at a location. The accident picture alone simply did not provide enough information to evaluate many of the sites.

F IMPROVEMENTS

The recommended improvements were determined based upon a complete analysis of the indicators, the recorded accident patterns, a thorough understanding of the geometrics of each site and generally accepted traffic engineering principles and practices. A description of the recommended improvements for each site, along with a discussion of the reasons for selecting those improvements, is contained in Section VIII.

Practical, cost-effective solutions to solving the hazard problems with an emphasis on low-cost strategies were examined first, in an effort to develop solutions which were within the short-term funding capabilities of the County. When low-cost solutions were not considered adequate, higher cost improvements were recommended. However, recognizing that funding problems could substantially delay the implementation of higher cost improvements, interim improvements were also presented at some of the sites.

Signing recommendations are based upon the Manual on Uniform Traffic Control Devices (MUTCD) and the Federal Highway Administration Report No. FHWA-RD-77-39 Signs and Markings for Low Volume Rural Roads.

The MUTCD recommends that warning signs in rural areas normally be placed 750 ft. in advance of the hazard. In urban areas the advance distance is only 250 ft. since speeds are relatively low. Specific conditions at a particular site can dictate a variance with these general guidelines. In this study in rural areas on paved surfaces, warning signs are placed 750 ft. in advance of the hazard. On roads with gravel surfaces, speeds are lower and the warning signs generally are placed 500 ft. in advance of the hazard. The distance is less in some locations where adherence to this policy may be confusing to the motorist because of other conditions at the site or lower approach speeds.

The advisory speeds on the curve warnings are determined based upon the geometrics of the curve, the radius, superelevation and grade.

Warning signs are placed on curves where the safe curve speed is over 10 mph less than the approach speeds, and advisory speed plates are used where the safe curve speed is over 15 mph less than the approach speeds.

V ANALYSIS

V. ANALYSIS

The indicator, Number of Accidents, is easily obtained directly from the accident reports. Care must be taken, however, when using the Number of Accidents indicator alone to compare sites, since it does not consider the volume of traffic. For example, only two of the sites evaluated in this study would appear to be hazardous based solely upon that indicator. The indicator, Accident Rate, however, presents an entirely different picture with most of the sites exceeding the indicator value considered to be "very hazardous". These two indicators must be used together in any analysis.

The indicator, Accident Severity, is easily determined from the accident reports and the accident severity tables contained in the FHWA report. The tables are reproduced in the Appendix.

The indicator, Volume/Capacity Ratio, is not significant on low volume roads.

In this study all but three of the sites had an indicator value of twenty or less. The highest was 41, and was the only one greater than 33, which is the lower limit of what is considered hazardous.

This indicator is also the most difficult to calculate. Since all of the sites had generally similar values, it is of minor value in making a relative evaluation of sites. While this indicator may be significant in areas where some of the sites have substantial volumes of traffic, future studies in Ravalli County need not use it.

A ranking system based solely upon accident ralated indicators can be misleading, however. On low volume roads one or two random accidents can result in very high indicator values for Accident Rate and Accident Severity. Conversely, a very hazardous site may have no accidents and may be overlooked as a result, when in fact, it should be improved. The use of indicators not related to accidents can supply additional information.

The non-accident indicators Sight Distance, Driver Expectancy, and Information System Deficiencies are very meaningful in this type of analysis.

They must be considered in any evaluation even if calculating the actual value is not done. It does not seem reasonable that a site could be properly evaluated and recommendations formulated without at least making a cursory examination of those factors. For example, before recommending signing improvements a determination of information system deficiencies would have to be made, as would sight distance and driver expectancy even if the analyst was not specifically trying to determine an indicator value. Similarly, a decision to remove obstructions on the inside of a curve or at an intersection could not be made without considering sight distance. The actual assignment of values to these parameters takes very little additional time, and the inclusion of these parameters in the calcualtions of HI's is very meaningful.

VI IMPLEMENTATION

VI. IMPLEMENTATION

All of the low-cost or interim improvements should be implemented. The total cost for all of these is about $13,500. If there are not sufficient funds to implement all of the recommendations, they should be implemented in the order shown on Table 1.

It is recommended that the first three sites be improved as soon as possible.

The higher cost, long-term improvements should be implemented as soon as money becomes available, but funds should not be diverted to these projects which could more effectively be used on a number of smaller projects. When funds become available, these projects should be constructed in the order shown on Table 2.

VII. RECOMMENDATIONS

This report represents only the first step in a continuing process of identifying, evaluating, and improving hazardous locations throughout Ravalli County. In order to assist the County in an ongoing process, the following recommended guidelines are presented.

1. The current procedure for keeping track of accidents on a location map or "pin map" should be continued and kept current. Accident investigators or reporting officers should be encouraged to take more care in the preparation of accident reports so that locations can be identified more accurately.

2. A systematic procedure for making traffic counts should be developed utilizing the County's automatic traffic counters.

3. The priority list should be updated once a year. Sites to be evaluated should include the following:

   - All sites on the previous priority list for which recommended improvements had not been implemented.
   - Additional sites identified through their accident history.
   - New sites identified by the Hazardous Location Committee (see Item No. 5).

   The total number should be approximately 20.

4. Any location which experiences three or more accidents, or two or more injury accidents, or one or more fatalities, in a three-year period, should be included in the next priority list update.

5. A Hazardous Location Committee should be formed and should include representatives of the County Road Department, the Sheriff's Department, the County Commissioners, and citizens at large. The purpose of the Committee is to identify locations which have not experienced a large number of accidents, but which appear to be hazardous and warrant inclusion in the sites to be studied in the next priority list update.

   This committee will recommend sites for inclusion in the study, but the actual investigation and evaluation of sites will be done by a separate study team. Once the sites for inclusion in the study have been determined, they should be evaluated according to the following procedure:

   a. At least once a year, a study team should be formed to update the priority list. This team may include persons on the Hazardous Location Committee discussed previously or other persons. A team of three persons is adequate.

b. Accident records for the 20 or so sites identified by the Committee should be gathered and analyzed to precisely locate the accidents and to determine the limits of the hazardous location. This could be done by one person and then reviewed by the study team.

c. The study team should visit each site and evaluate them for the indicators Sight Distance, Driver Expectancy, and Information System Deficiencies. These evaluations can be made rather easily in a couple of days for the 20 sites. At the same time, the team would prepare preliminary recommendations for improvements which would be revised following a review of the accident data and calculation of the HI's.

d. The HI for each site is then calculated. The indicators Volume/Capacity Ratio, Traffic Conflicts, and Erratic Maneuvers need not be included. Again, this can be done by one person and then reviewed by the entire study team.

e. The study team would review the HI's and prepare final recommendations for improvements. Estimates would then be made and the final revised priority list prepared.

At least one person on the study team should be an experienced traffic engineer who is familiar with the Manual on Uniform Traffic Control Devices, the Federal Highway Administration's procedures contained in FHWA-RD-77-83, and accepted principles and practices of traffic engineering. The person could be a full-time employee of the County, a consultant hired specifically for the purpose of working with the study team, or an employee of the State or other agency on loan to the County.

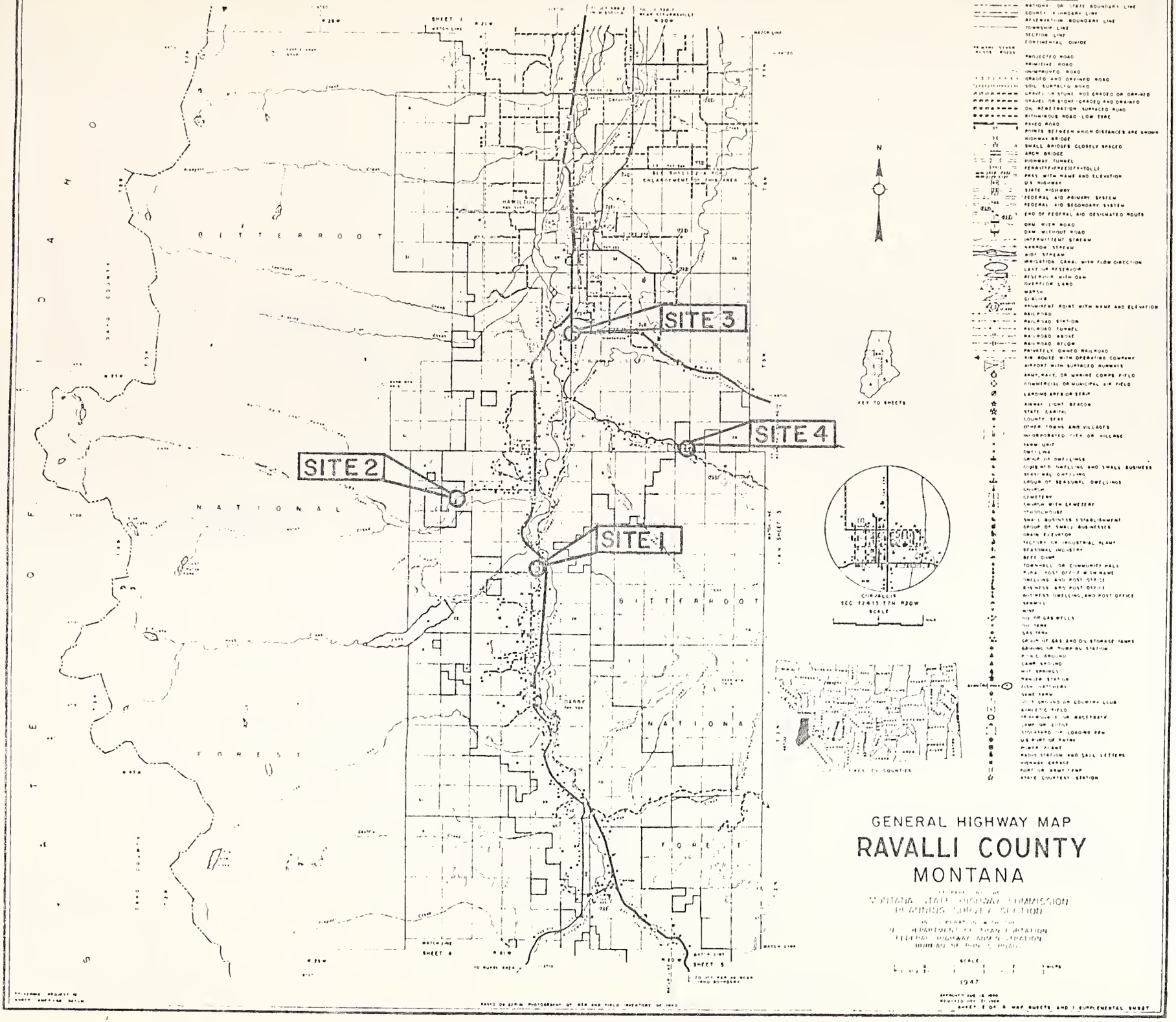
All Warning Signs should be 30" x 30" and all Advisory Speed Plates should be 18" x 18" unless noted otherwise.

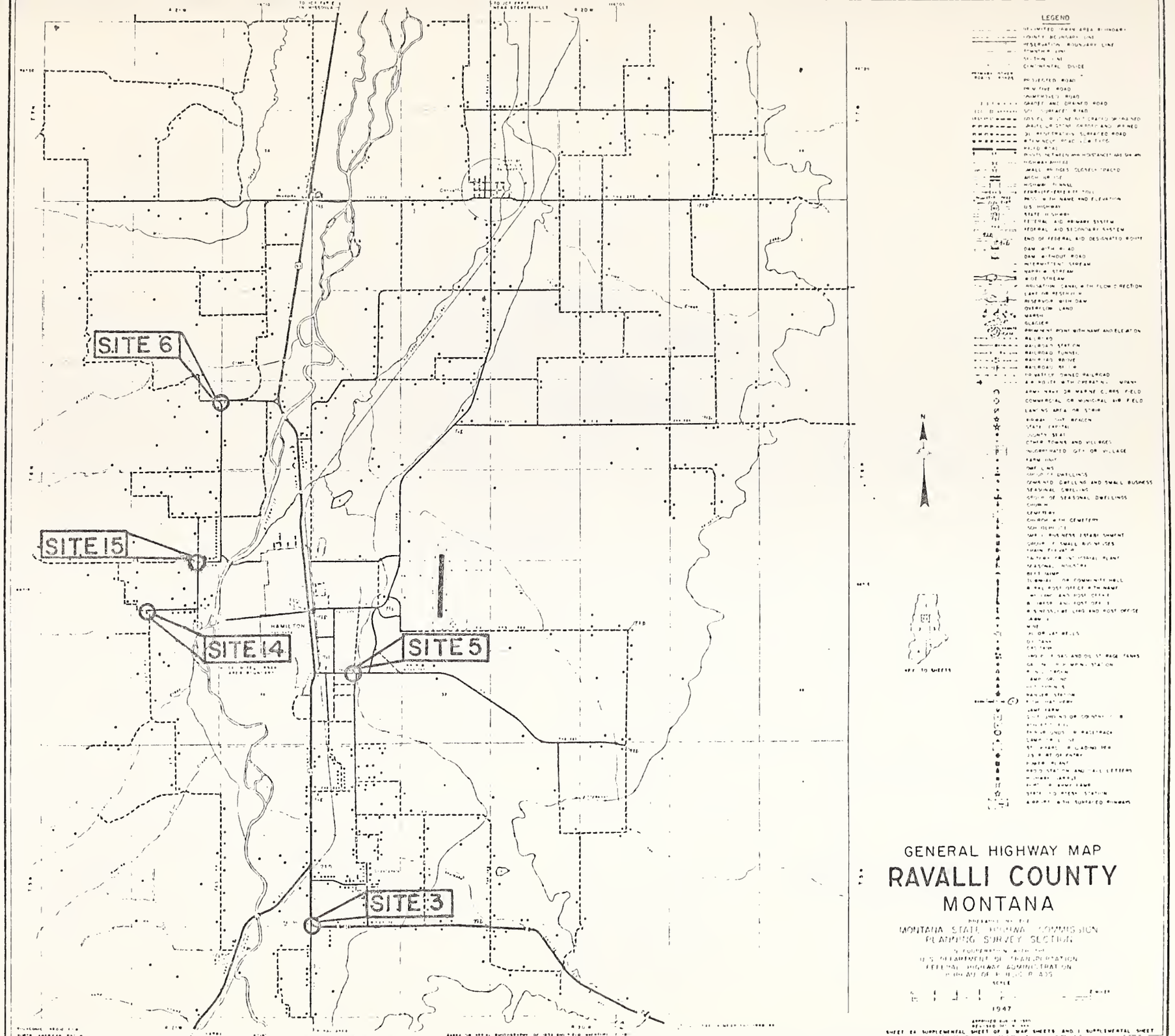
As a general recommendation, the County should also develop a systematic approach to weed, bush and tree removal to improve sight distances within the right-of-way limits on all County-maintained roads, if such a procedure does not currently exist.

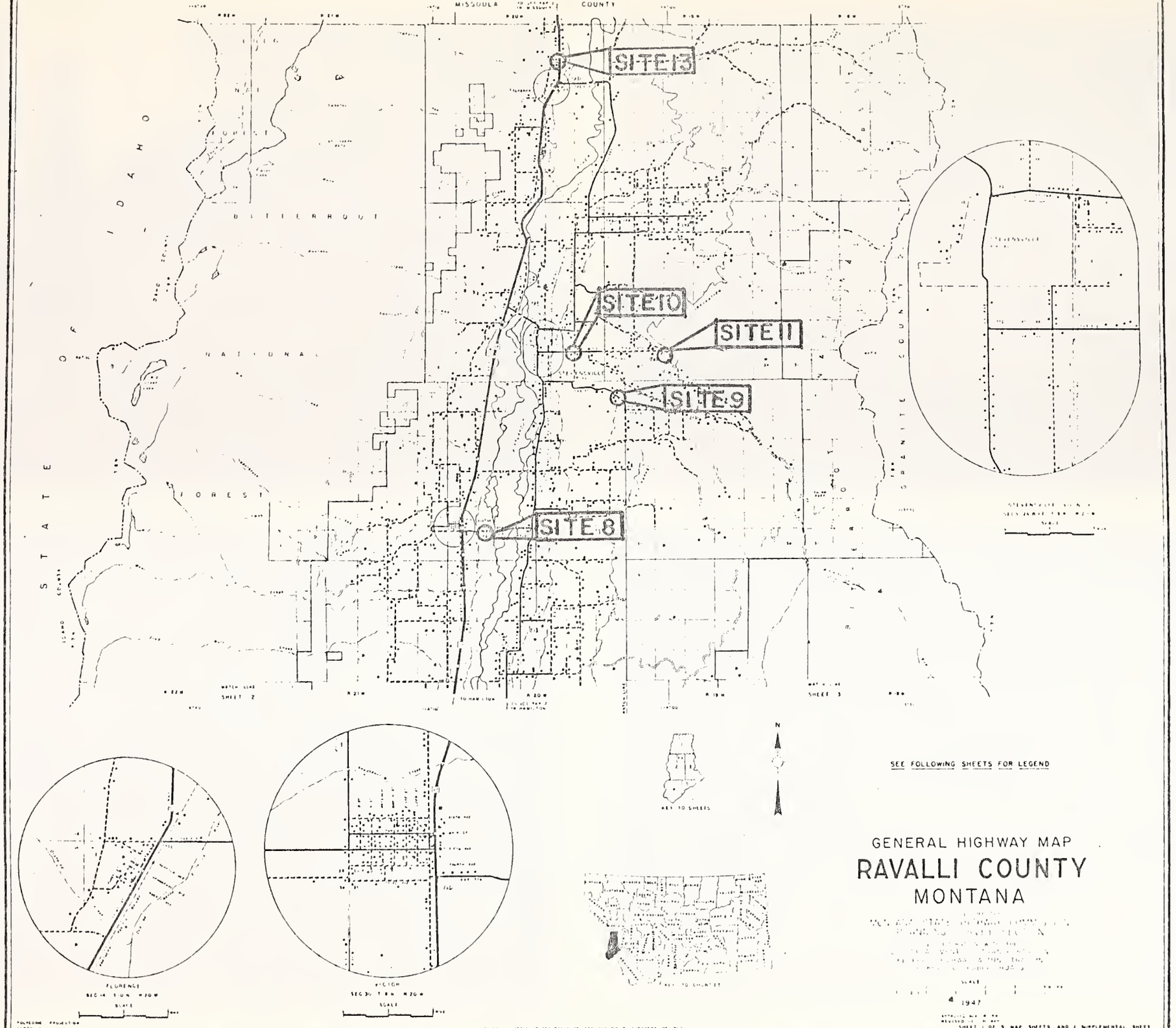
RAVALLI COUNTY

HIGH HAZARD STUDY

SITE NO.	DESCRIPTION
1	Jct. of Old Darby Road & Como Lake Road
2	Upper end of Lost Horse Road
3	Jct. of Sleeping Child Road & Skalkaho Road
4	East of pavement on Sleeping Child Road
5	Intersection of Golf Course Road & Old Grantsdale Road
6	Intersection of Bowman Road & Ricketts Road
8	Victor Crossing Road
9	East end of Pine Hollow Road
10	Intersection of Middle Burnt Fork Road & Logan Lane
11	Intersection area of Middle Burnt Fork Road and North Burnt Fork Road
13	Intersection of Tie Chute Lane and Old Hwy. 93
14	Intersection of West Side Road & West Bridge Road
15	Intersection of Ricketts Road & Blodgett Camp Road


SITE 1
SITE 2
SITE 3
SITE 4
BITTERROOT
NATIONAL
FOREST
LEGEND
GENERAL HIGHWAY MAP
RAVALLI COUNTY
MONTANA
1947


SITE 6
SITE 15
SITE 14
SITE 5
SITE 3
HAMILTON
LEGEND
GENERAL HIGHWAY MAP
RAVALLI COUNTY
MONTANA
MONTANA STATE HIGHWAY COMMISSION
PLANNING SURVEY SECTION
U.S. DEPARTMENT OF COMMERCE
FEDERAL HIGHWAY ADMINISTRATION
1947


SITE 13
SITE 10
SITE 11
SITE 9
SITE 8
MISSOULA COUNTY
RAVALLI COUNTY
BITTERROOT
NATIONAL FOREST
STATE OF IDAHO
SEE FOLLOWING SHEETS FOR LEGEND
GENERAL HIGHWAY MAP
RAVALLI COUNTY
MONTANA
1947

Site 1 - Old Darby Road & Como Lake Road

Site 2 - Lost Horse Road

Site 3 - Sleeping Child Road & Skalkaho Road

Site 4 - Sleeping Child Road

Site 5 - Golf Course Rd. & Old Grantsdale Rd.

Site 6 - Bowman Road & Ricketts Road

Site 8 - Victor Crossing Road

Site 9 - Pine Hollow Road

Site 10 - Middle Burnt Fork Rd. & Logan Lane

Site 11 - Middle Burnt Fork Road

Site 13 - Tie Chute Lane & Old Hwy. 93

Site 14 - West Side Road & West Bridge Road

Site 15 - Ricketts Road & Blodgett Camp Road

SITE NO. 1

Location

Site No. 1 is a segment including the intersection of Old Darby Road and Como Lake Road, approximately 12 miles south of Hamilton.

Description

Old Darby Road and Lake Como Road each serves a number of rural residences and provides primary access to the Lake Como recreation area. Both roads are typical gravel surfaced rural roads. The topography is generally level in the area with Old Darby Road rising to the south of the intersection. The north leg of the intersection contains three concrete bridges. Poor visibility is experienced at the northernmost bridge. Average Daily Traffic (ADT) has been measured at 300 vehicles per 24 hour period.

Accident History

There have been four reported accidents on this segment. All were single vehicles and two were injury accidents. Three were during the day and three were on dry surfaces.

Evaluation

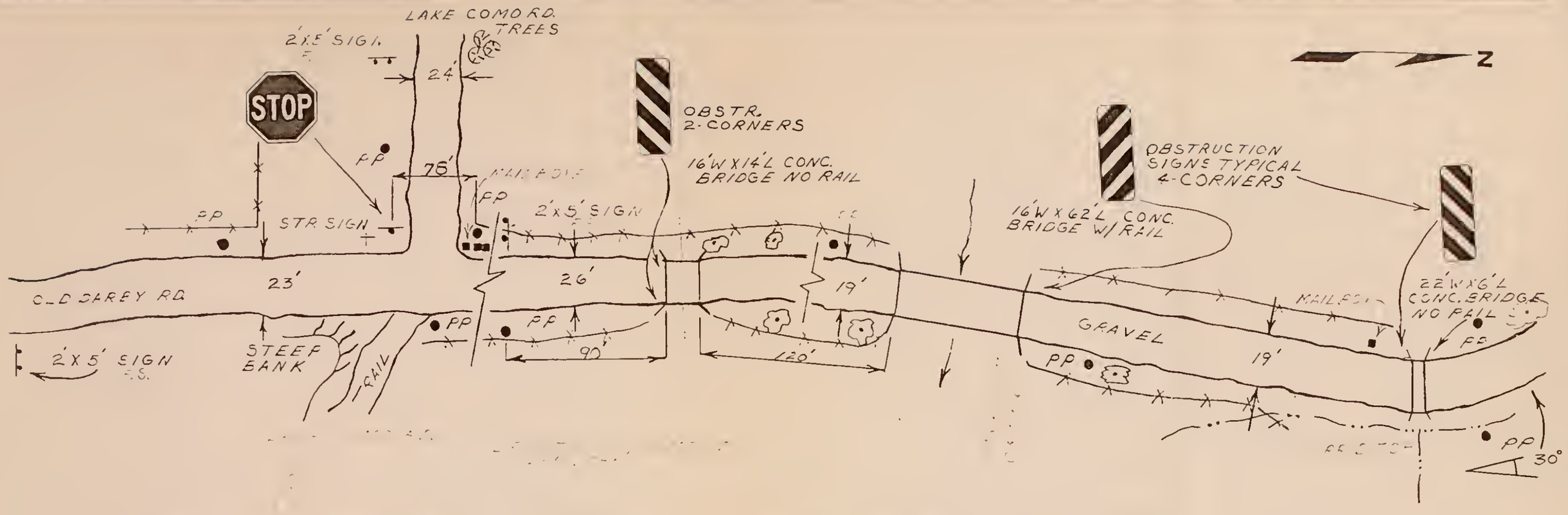
Three accidents occurred when drivers lost control due either to unattentive driving or excessive speed; one of these failed to make the turn at the north end of the segment. The fourth accident occurred when the driver lost control crossing a bridge. Restricted sight distance at the curve on the north end of the segment prevents drivers from seeing an approaching vehicle or the bridges ahead. In addition, sight distance is restricted on the south leg by the road grade.

Recommendations

- Remove the tree prior to the curve at the north end.
- Install a curve sign (W1-2) on the north approach.
- Install a T symbol sign (W2-4) on the north and south approaches (250' from intersection) and a double arrow sign (W1-7) on the Lake Como Road approach.
- Install obstruction markers (OM-3) on the north end of the middle bridge.

There are long-range plans by the U.S. Forest Service to extend Lake Como Road due east past the intersection to Highway 93. With this in mind, no long term improvements are recommended at this location.

Estimated cost: $720



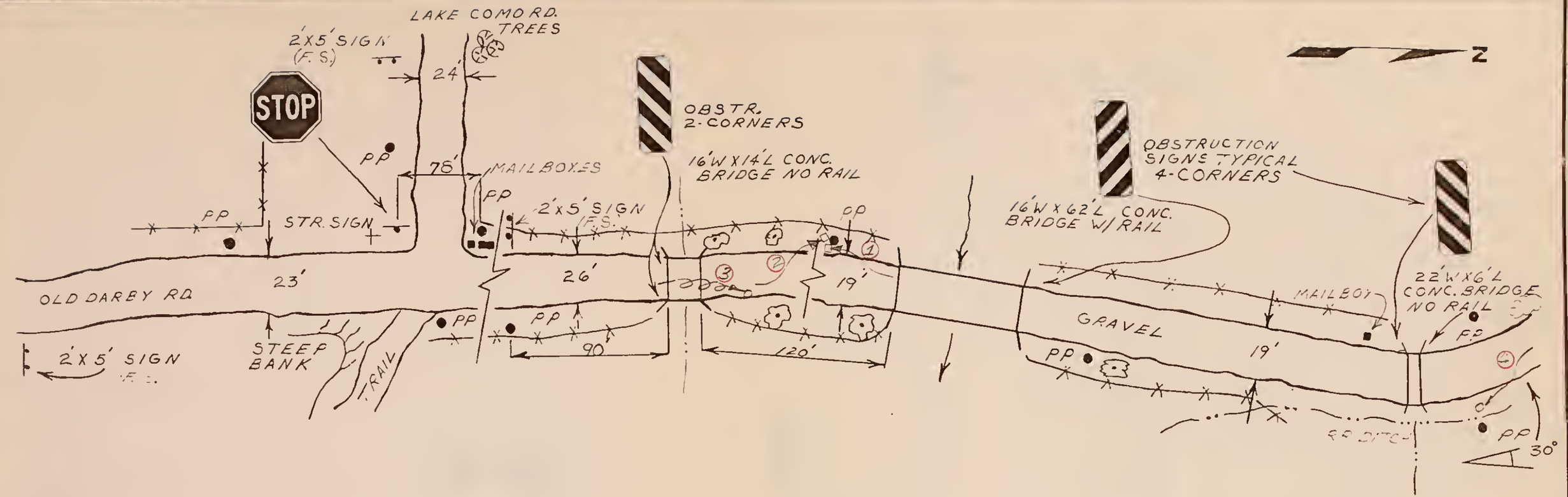
HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

CONDITION DIAGRAM
SITE 1

Jct. of Old Darby Road & Como Lake Road

DATE: 10/20/80

PLATE 1



ACCIDENTS							
NO.	DAY	DATE	TIME	WEATHER	ROAD CONDITION	DAY / NIGHT	INJ. / P.D.
1	Sat.	7-17-76	17:20	Clear	Dry	Day	P.D.
2	Sun.	7-04-78	6:30	Rain	Wet	Day	P.D.
3	Sun.	4-16-78	18:50	Clear	Dry	Day	2-Inj.
4	Wed.	9-30-77	20:00	Clear	Dry	Night	1-Inj.

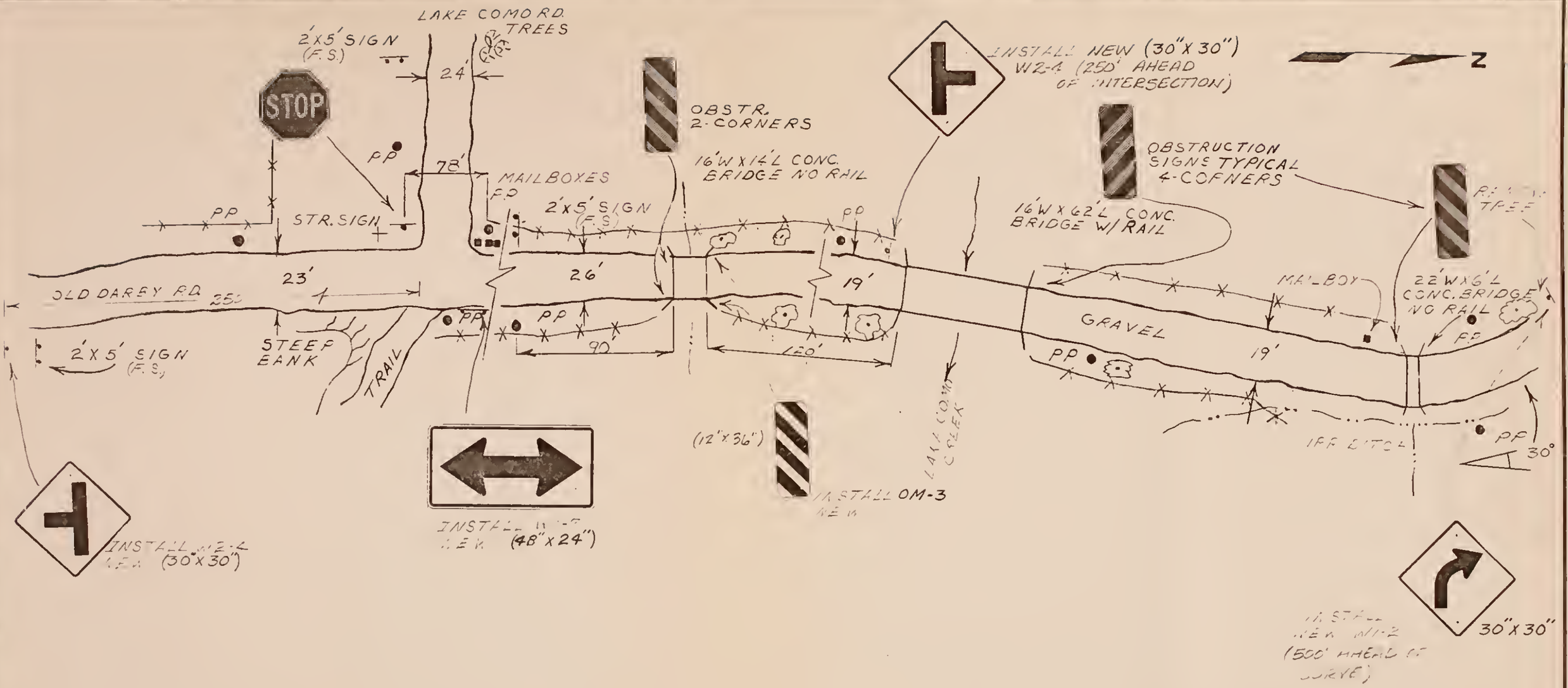
HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

ACCIDENT DIAGRAM
SITE 1

Jct. of Old Darby Road & Como Lake Road

DATE: 10/20/80

PLATE 2



HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

IMPROVEMENT DIAGRAM
SITE 1

Jct. of Old Darby Road & Como Lake Road

DATE: 10/20/80

PLATE 3

SITE NO. 2

Location

Site No. 2 is a segment of Lost Horse Road approx. nine miles south of Hamilton and three miles west of U.S. 93.

Description

Lost Horse Road is the main access to Lost Horse Lake, Fish Lake, and the Lost Horse Nordic Village, which is a small winter resort area. There is a tavern at the Lost Horse Nordic Village, and it is open year-round. The road segment is a graded dirt section; the paved portion of Lost Horse Road ends about one half mile east of the beginning of the segment. Roadway width is 17' to 22', with intermittent pullouts. Signing is limited to designation of a school bus stop at the east end of the segment. ADT is 270 vehicles.

Accident History

There have been six reported accidents on this segment. Two were two vehicle head-on or sideswipe, and three were single vehicles which lost control and left the road. The remaining accident involved two vehicles leaving private drives. Two of the single vehicle accidents involved drunken drivers.

Evaluation

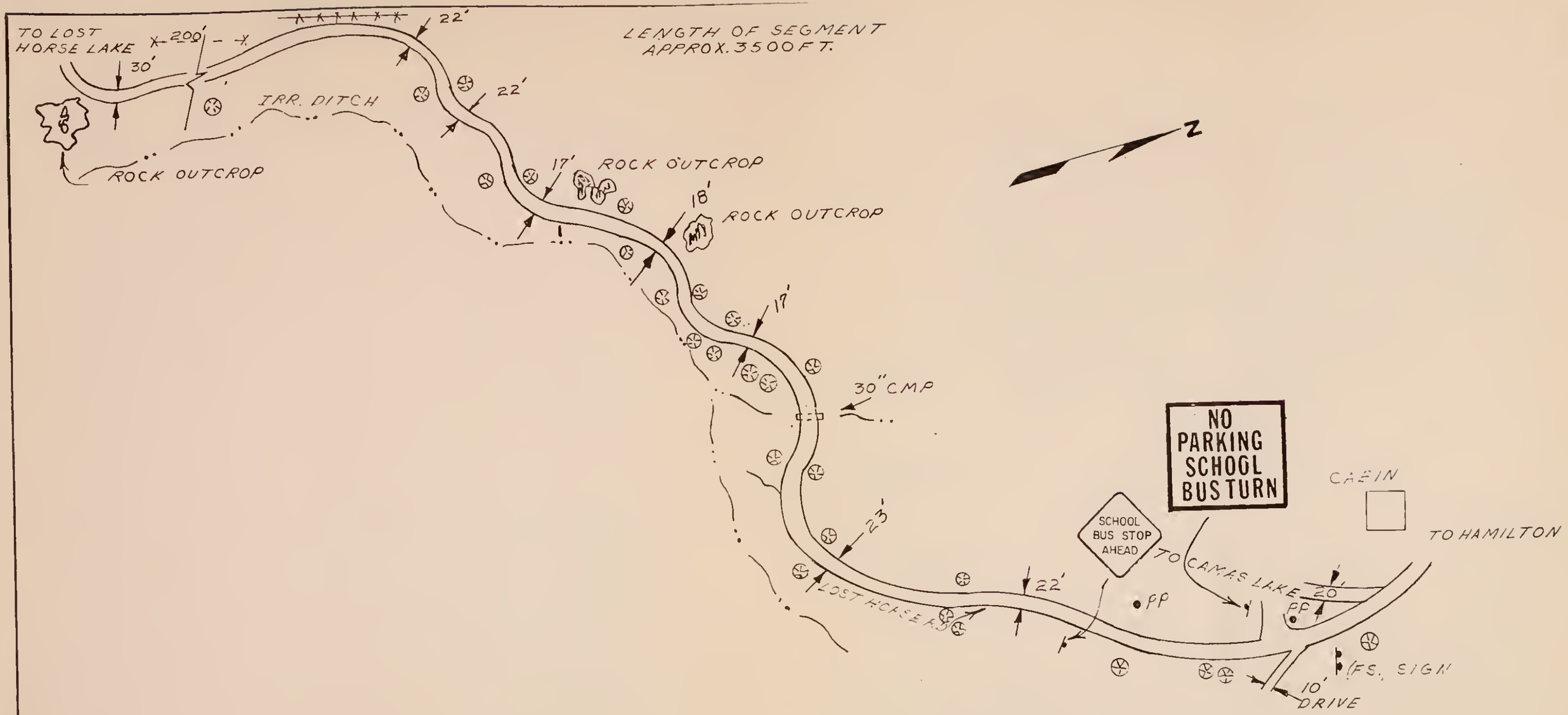
This segment of road is similar to that on both approaches. Sight distance is restricted in many places because of the horizontal and vertical alignment of the roadway. Two of the reported accidents involved drinking drivers.

Because of the nature of the roadway and the low traffic volumes, a general warning sign should be placed at the beginning of the unpaved roadway section from each direction.

Recommendations

- Install a Winding Road warning sign (W1-5) and supplemental plaque at the end of the pavement
- Install a Winding Road warning sign (W1-5) and supplemental plaque 250' north of Lost Horse Nordic Village
- Remove the existing Road Narrows sign and replace with a Pavement Ends sign (W8-3) 750' in advance of the end of pavement

Estimated cost: $360



HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

CONDITION DIAGRAM
SITE 2
Upper End of Lost Horse Road

DATE: 10/20/80

PLATE 4

ACCIDENTS							
NO.	DAY	DATE	TIME	WEATHER	ROAD CONDITION	DAY / NIGHT	INJ. / P.D.
1	Sun.	7-24-77	1:00	Clear	Dry	Night	P.D.
2	Fri.	2-09-79	17:00	Snow	Icy	Day	P.D.
3	Sun.	1-29-78	13:50	Clear	Icy	Day	P.D.
4	Fri.	7-21-79	17:40	Clear	Dry	Day	P.D.
5	Sat.	11-03-79	20:00	Clear	Dry	Night	1-Inj.
6	Fri.	4-20-79	23:00	Clear	Dry	Night	1-Inj.

HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

ACCIDENT DIAGRAM
SITE 2

Upper End of Lost Horse Road

DATE: 10/20/80

PLATE 5

HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

IMPROVEMENT DIAGRAM
SITE 2

Upper End of Lost Horse Road

DATE: 10/20/80

PLATE 6

SITE NO. 3

Location

Site No. 3 is the junction of Skalkaho Road (Mont. 38) and Sleeping Child Road (Mont. 501) three miles south of Hamilton.

Description

Sleeping Child Road intersects a 9°30' curve of Skalkaho Road at a 90° angle. Both roads are paved and the pavement is in good condition. Skalkaho Road is signed for 70 mph and Sleeping Child Road is stop controlled. Current ADT is 3,890 vehicles.

Accident History

There have been ten reported accidents at this site, all single vehicles. Seven were at night and four were on wet or icy pavement. Five of the ten accidents resulted in injuries. Six of the accidents were failure to negotiate the curve on Skalkaho Road, and three others were failure to stop on Sleeping Child Road.

Evaluation

The accidents all involved excessive speed, driver inattention and/or failure to adjust speeds to the road conditions. Skalkaho Road is well signed as is Sleeping Child Road, although the approach warning signs on Sleeping Child Road are partially obscured by tree branches, thereby reducing sight distance. There are single face delineators at random intervals around the outside of the curve on Skalkaho Road, although most are damaged.

It should be noted that the chevrons on the Sleeping Child Road approach were installed recently, and after the accident record period.

Recommendations

- Trim the tree branches obscuring the approach signing on Sleeping Child Road
- Remove the double arrow guide sign (M6-4) on the Sleeping Child Road approach.
- Remove the existing delineators on the outside of the Skalkaho Road curve and replace with Design "C" Type II bi-directional delineators at 70' spacings, two feet outside the pavement edge
- Install a stop bar and double solid lines (390') on the Sleeping Child Road approach
- Obliterate the dirt road between the east and south legs, and obliterate the north end of the dirt access road to the west
- Relocate the existing double arrow sign (W1-7) to 20' off the shoulder; remove the barricade
- Remove the large arrow signs (W1-6) on the north and east approaches
- Remove the West cardinal direction marker (M3-4)

Estimated cost: $810

N

40 M.P.H.

501

330'

24'

480'

JCT 501

PP

WEST

DIRT RD.

STR. SIGN

PP

DIRT SHLDR.

3-BOARD FENCE

501

① ← HAMILTON
ANACONDA →

CAUTION RANGE CATTLE ②

SPEED LIMIT 50

STOP

R/W MON

PP

SKALKAHO RD.

24'

DIRT RD.

PP

PP

SLEEPING CHILD RD.

3740

2640

1400

TRAFFIC VOLUME (ADT)

JCT MONTANA 38 ⑬

MAILBOX

115'

TREES

32'

150'

STOP AHEAD ⑫

NO SCALE

HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

CONDITION DIAGRAM
SITE 3

Jct. of Sleeping Child Road & Skalkaho Road

DATE: 10/20/80

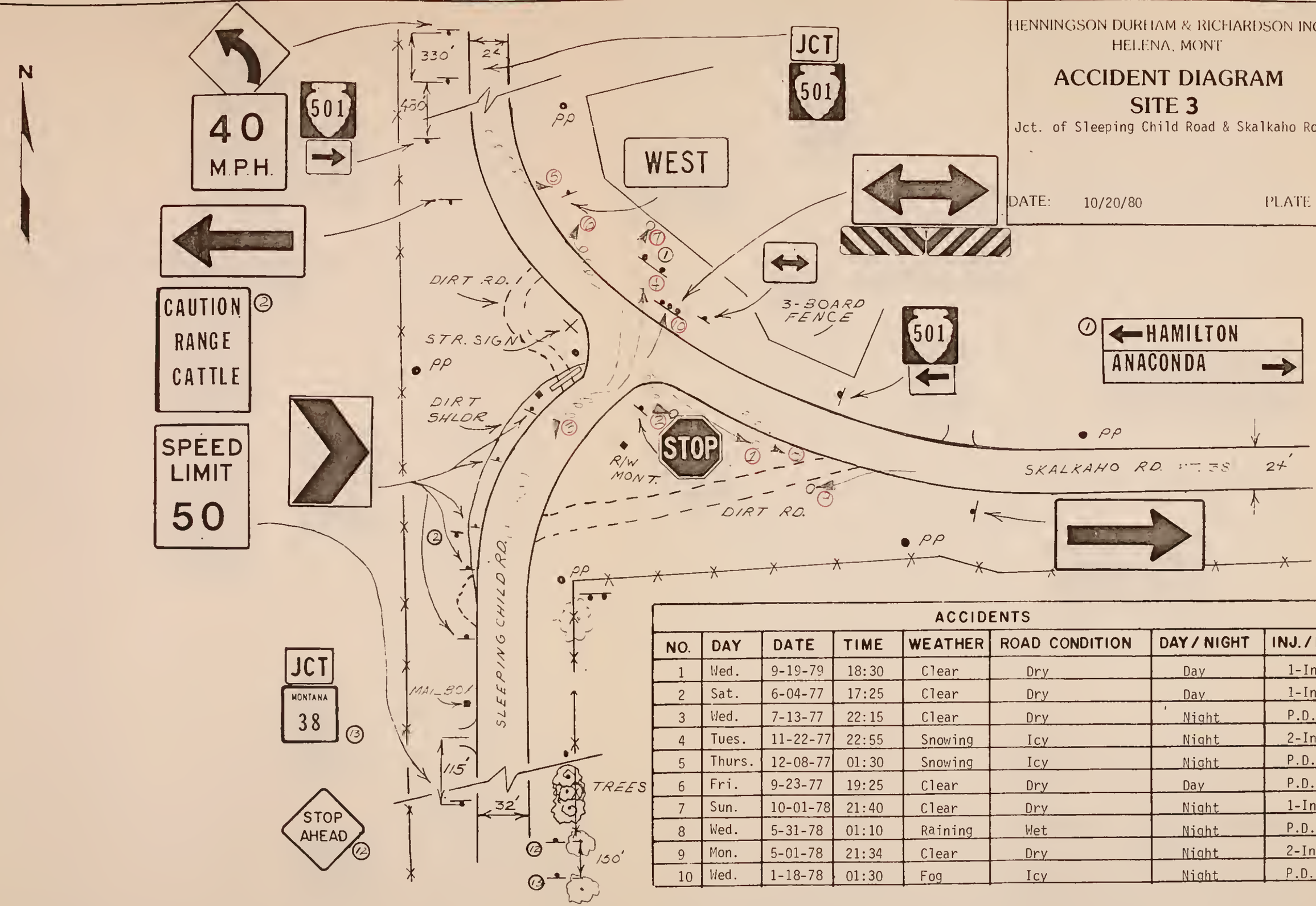
PLATE 7

HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT

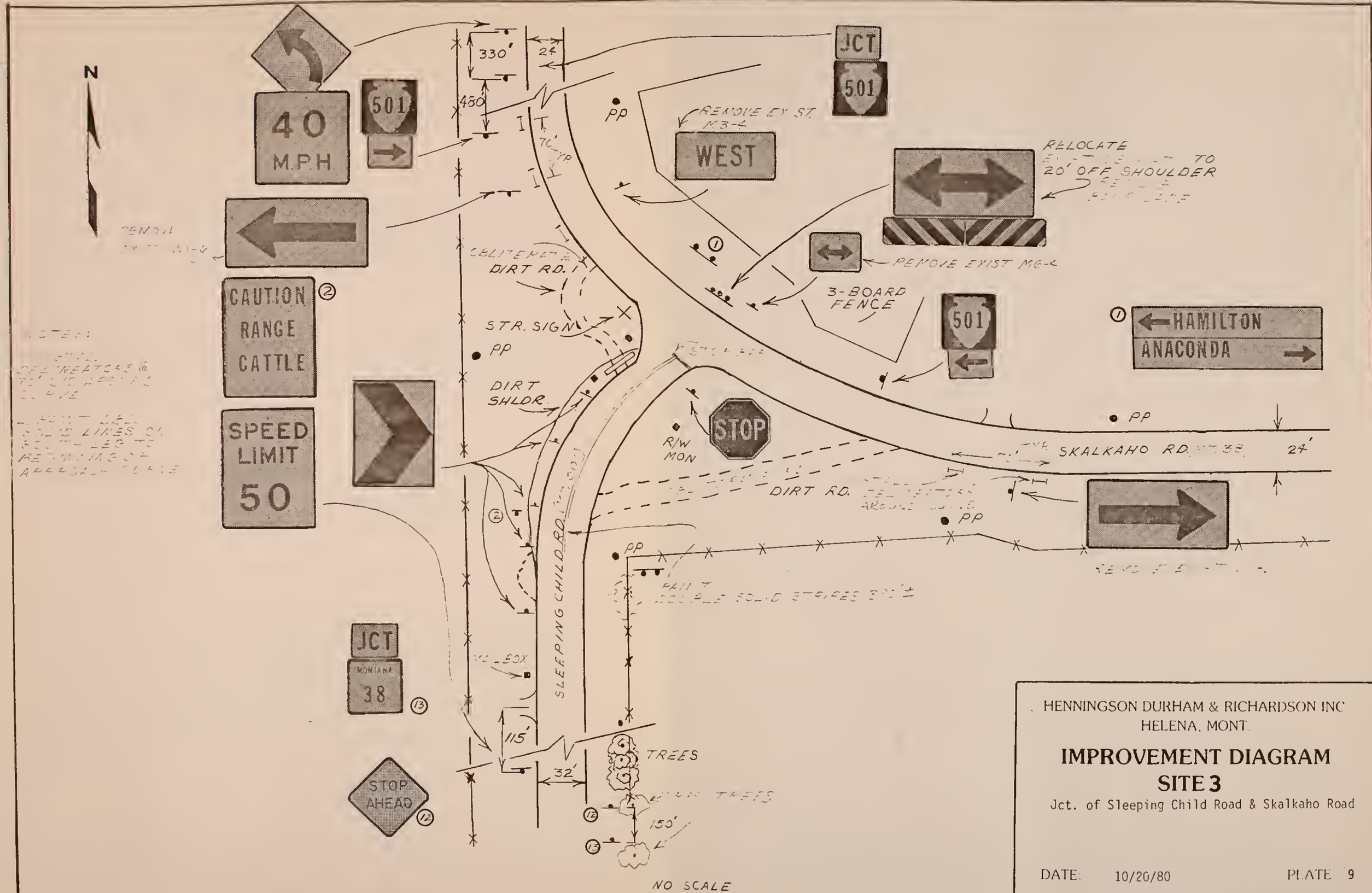
ACCIDENT DIAGRAM
SITE 3

Jct. of Sleeping Child Road & Skalkaho Road

DATE: 10/20/80 PLATE 8



ACCIDENTS							
NO.	DAY	DATE	TIME	WEATHER	ROAD CONDITION	DAY / NIGHT	INJ. / P.D.
1	Wed.	9-19-79	18:30	Clear	Dry	Day	1-Inj.
2	Sat.	6-04-77	17:25	Clear	Dry	Day	1-Inj.
3	Wed.	7-13-77	22:15	Clear	Dry	Night	P.D.
4	Tues.	11-22-77	22:55	Snowing	Icy	Night	2-Inj.
5	Thurs.	12-08-77	01:30	Snowing	Icy	Night	P.D.
6	Fri.	9-23-77	19:25	Clear	Dry	Day	P.D.
7	Sun.	10-01-78	21:40	Clear	Dry	Night	1-Inj.
8	Wed.	5-31-78	01:10	Raining	Wet	Night	P.D.
9	Mon.	5-01-78	21:34	Clear	Dry	Night	2-Inj.
10	Wed.	1-18-78	01:30	Fog	Icy	Night	P.D.



HENNINGSON DURHAM & RICHARDSON INC
HELENA, MONT.

IMPROVEMENT DIAGRAM
SITE 3

Jct. of Sleeping Child Road & Skalkaho Road

DATE: 10/20/80

PLATE 9

SITE NO. 4

Location

Site No. 4 is a segment of Sleeping Child Road, and is approx. 11 miles southeast of Hamilton. The site is located adjacent to the Bitteroot National Forest.

Description

This segment begins about one-half mile east of the end of pavement on Sleeping Child Road. The road, which is confined between rock hillsides to the north and Sleeping Child Creek on the south, is loose gravel and varies from 21' to 31' in width. Sight distance at the east and west ends of the segment is restricted by the hillside; sight distance around the long curve in the middle of the segment is restricted by trees on the inside of the curve. ADT is 150 vehicles.

Accident History

Eleven reported accidents were initially identified along Sleeping Child Road. Seven have been identified as within the National Forest boundaries, and the remaining four are located on this roadway segment. Three of the four accidents occurred at night, and all four were on a dry roadway. All the accidents were single vehicles, and were westbound (to Hamilton). All lost control and went off the road.

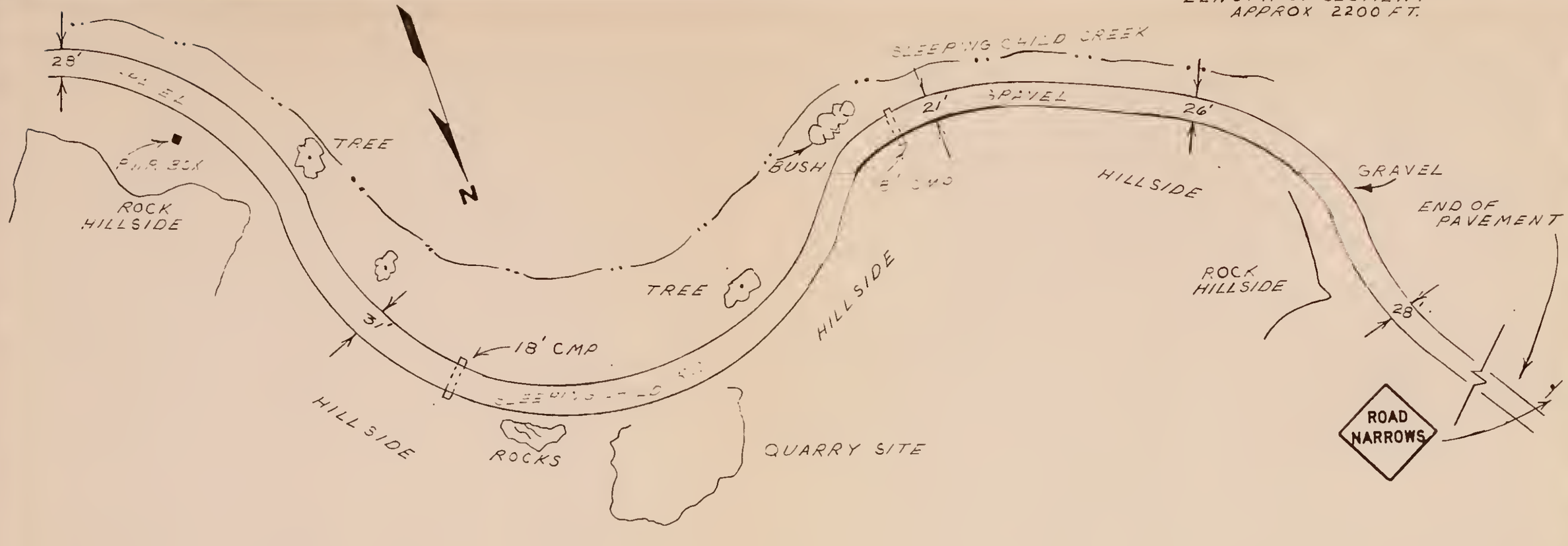
Evaluation

Nine of the eleven accidents reported on Sleeping Child Road involved westbount vehicles which lost control through excessive speed, driver inattention and/or failure to adjust speeds to the road conditions. It was observed during the site inspections that the road surface in this segment is loose when dry, but firms up when there is moisture.

Recommendations

- Remove the existing Road Narrows sign and replace with a Pavement Ends sign (W8-3) 750' in advance of the end of pavement.
- Install a Winding Road warning sign (W1-5) with a supplemental plaque at the end of the pavement and 250' north of Sleeping Child resort area.
- Remove the trees on the inside of the large curve on the roadway segment, and remove the rocks on the outside of the curve.
- Install Design "C" Type II bi-directional delineators at 50' spacings, two feet outside the shoulder as shown.

Estimated cost: $930



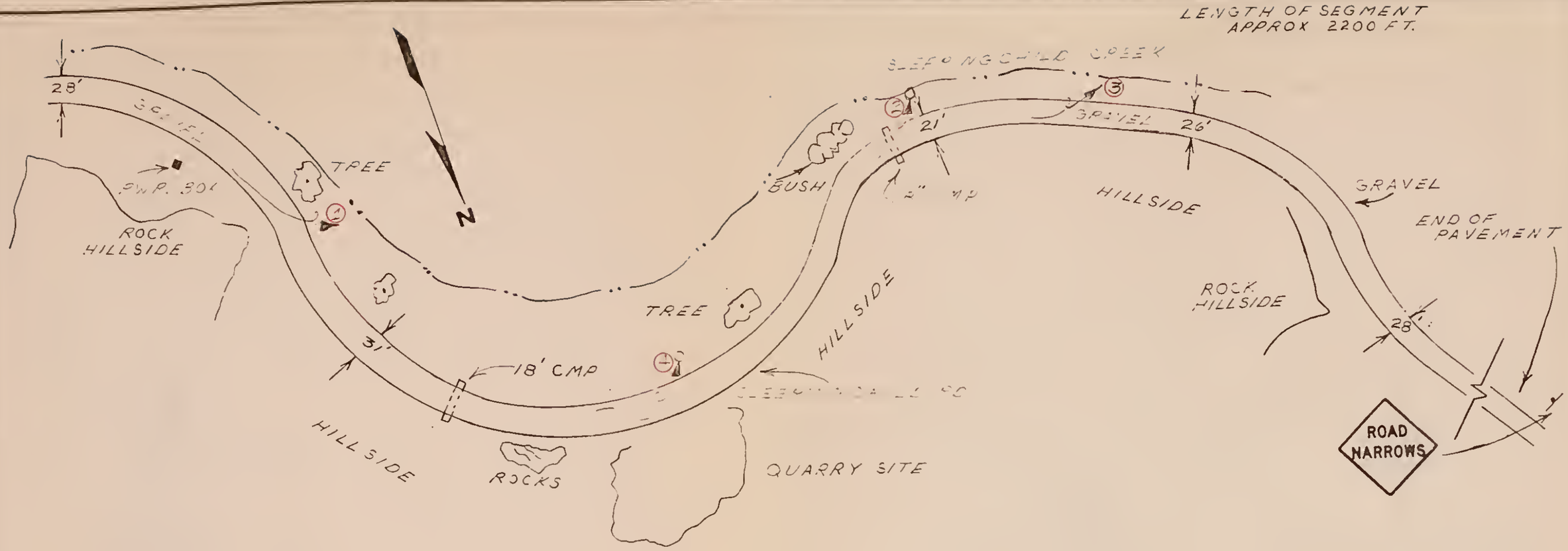
HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

CONDITION DIAGRAM
SITE 4

East of Pavement on Sleeping Child Road

DATE: 10/20/80

PLATE 10



ACCIDENTS							
NO.	DAY	DATE	TIME	WEATHER	ROAD CONDITION	DAY / NIGHT	INJ. / P.D.
1	Sun.	9-10-78	04:00	Clear	Dry	Night	P.D.
2	Sat.	5-19-79	19:30	Clear	Dry	Day	2-Inj.
3	Fri.	9-21-79	01:30	Clear	Dry	Night	P.D.
4	Fri..	6-04-77	16:00	Clear	Dry	Night	1-Inj.

HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT

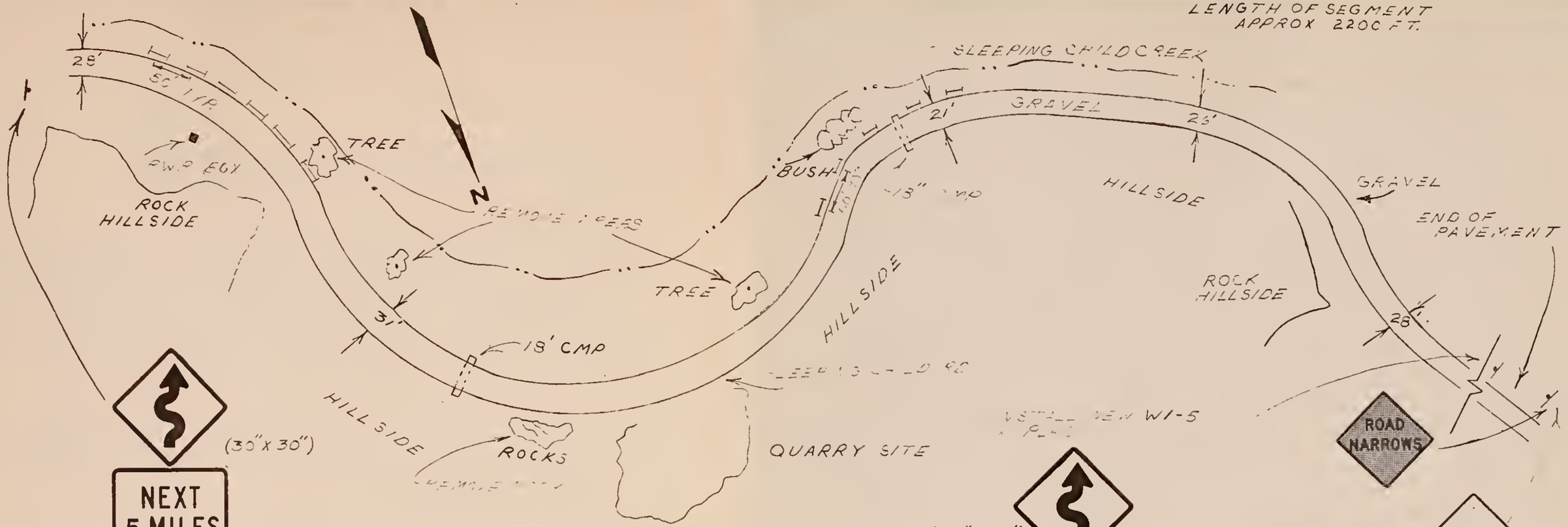
ACCIDENT DIAGRAM
SITE 4

East of Pavement on Sleeping Child Road

DATE: 10/20/80

PLATE 11

LENGTH OF SEGMENT
APPROX 2200 FT.



INSTALL NEW W1-5 WILDLIFE
250' NORTH OF RESORT AREA

NOTE: INSTALL SIGNS
@ 50' C/C ALTERNATIN

HENNINGSON DURHAM & RICHARDSON INC
HELENA, MONT.

IMPROVEMENT DIAGRAM
SITE 4

East of Pavement on Sleeping Child Road

DATE: 10/20/80

PLATE 12

SITE NO. 5

Location

Site No. 5 is the intersection of Golf Course Road, Old Grantsdale Road and Kurtz Lane. The site is ½ mile east of the Hamilton City Limits.

Description

Golf Course Road forms the east and west legs of the intersection and is the major traffic movement. Kurtz Lane and Old Grantsdale are the north and south legs respectively, and are offset 178'. All roadways are paved, and Golf Course Road is 24' wide while Kurtz Lane and Old Grantsdale Road are each 20' wide. Kurtz Lane is yield controlled and Old Grantsdale Road is stop controlled. The area is flat, but sight distance is restricted west of Old Grantsdale Road and Kurtz Lane both by bushes and weeds. ADT is 7,870 vehicles.

Accident History

There have been ten reported accidents at this site, three which were angle accidents and six which were single vehicles which failed to stop on Old Grantsdale Road. Six of the accidents were at night and five were on snow or ice roadways.

Evaluation

The site is not hazardous because of the offset of Kurtz Lane and Old Grantsdale Road, but because of the restricted sight distance to the west from both approaches. The intersection is typical of adjacent locations on Golf Course Road.

The accidents which involved vehicles failing to stop on Old Grantsdale Road were apparently caused by excessive speed or failure to adjust speed for the road conditions; the T symbol sign on the Old Grantsdale Road approach is also located too close to the intersection for observed vehicle speeds.

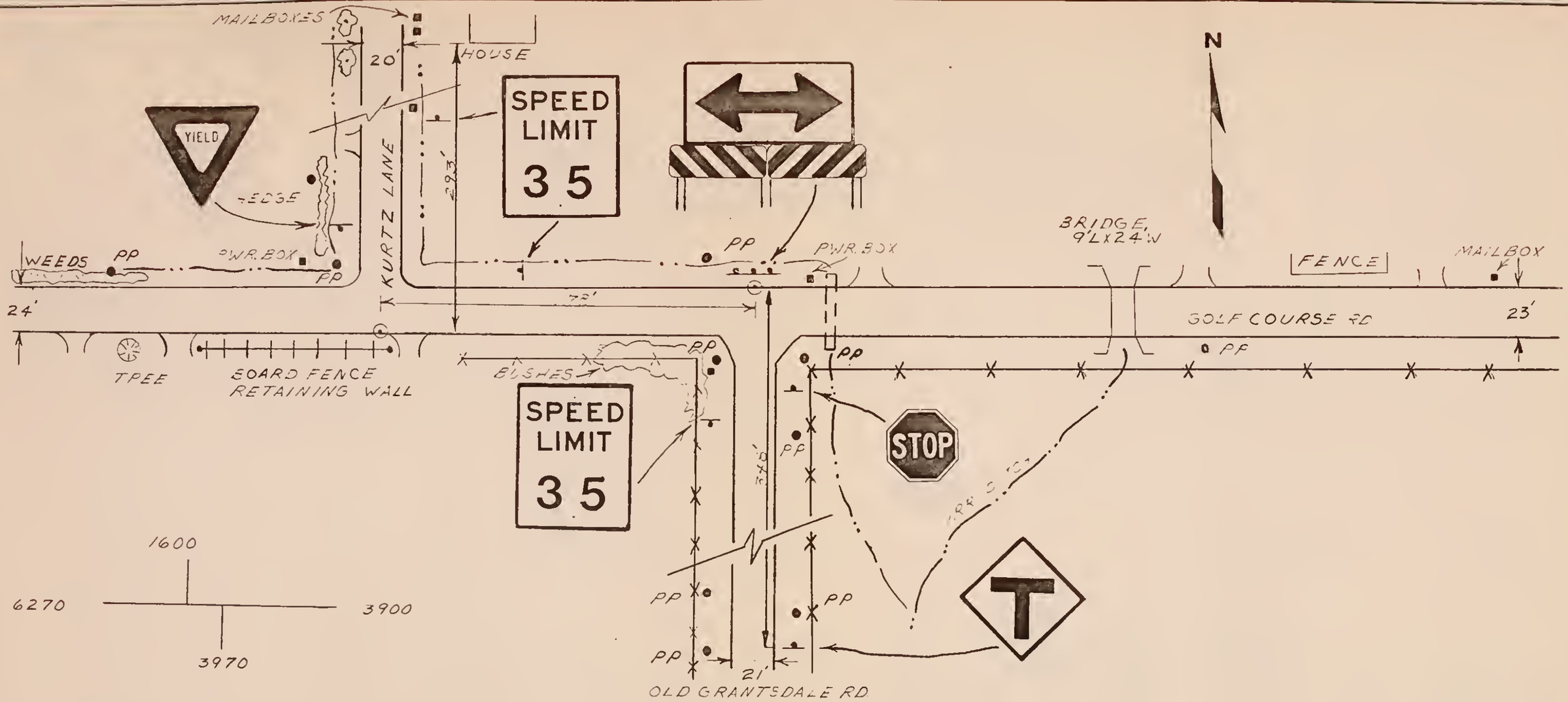
Because of the high traffic volumes at this location, a stop sign is warranted on the Kurtz Lane approach.

Recommendations

- Remove the yield sign on the Kurtz Lane approach and replace with a Stop sign (R1-1).
- Reset the T symbol sign on the Old Grantsdale Road approach to 500' in advance of the intersection
- Remove the weeds and bushes restricting the sight distance
- Install stop bars and double solid lines (50') on Old Grantsdale Road and Kurtz Lane
- Relocate the existing double arrow sign (R1-7) to 15' off shoulder and install 24"X40' CMP with cover material in ditch opposite the approach; and remove the barricade.
- A long term recommendation is to eliminate the offset between Kurtz Lane and Old Grantsdale Road by realigning both roadways to a standard crossroad.

Estimated cost of interim improvements: $1,320

Estimated cost of ultimate improvements: $42,460



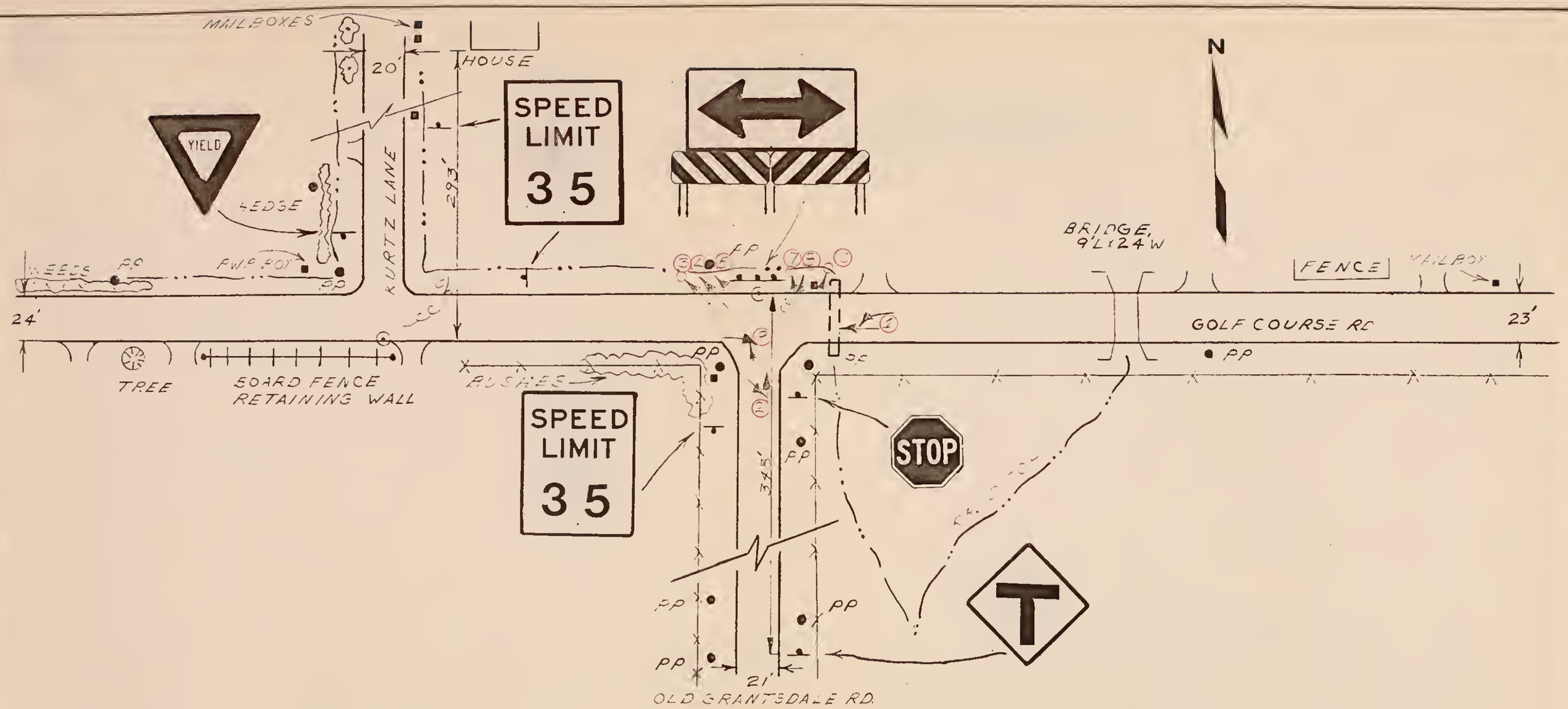
HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

CONDITION DIAGRAM
SITE 5

Intersection of Golf Course Road & Old Grantsdale Road

DATE: 10/20/80

PLATE 13



ACCIDENTS							
NO.	DAY	DATE	TIME	WEATHER	ROAD CONDITION	DAY / NIGHT	INJ. / P.D.
1	Mon.	5-30-77	19:30	Clear	Dry	Day	P.D.
2	Sun.	2-20-77	17:18	Clear	Dry	Day	P.D.
3	Fri.	12-09-77	02:00	Clear	Icy	Night	1-Inj.
4	Fri.	6-01-77	02:00	Clear	Dry	Night	P.D.
5	Thur.	11-23-78	05:35	Clear	Icy	Night	P.D.
6	Mon.	12-11-78	11:50	Snowing	Snow	Night	P.D.
7	Wed.	1-24-79	03:00	Clear	Icy	Night	1-Inj.
8	Tues.	8-21-79	15:20	Clear	Dry	Day	P.D.
9	Sat.	7-12-77	13:00	Clear	Dry	Day	P.D.
10	Sun.	11-25-79	02:00	Clear	Icy	Night	1-Inj.

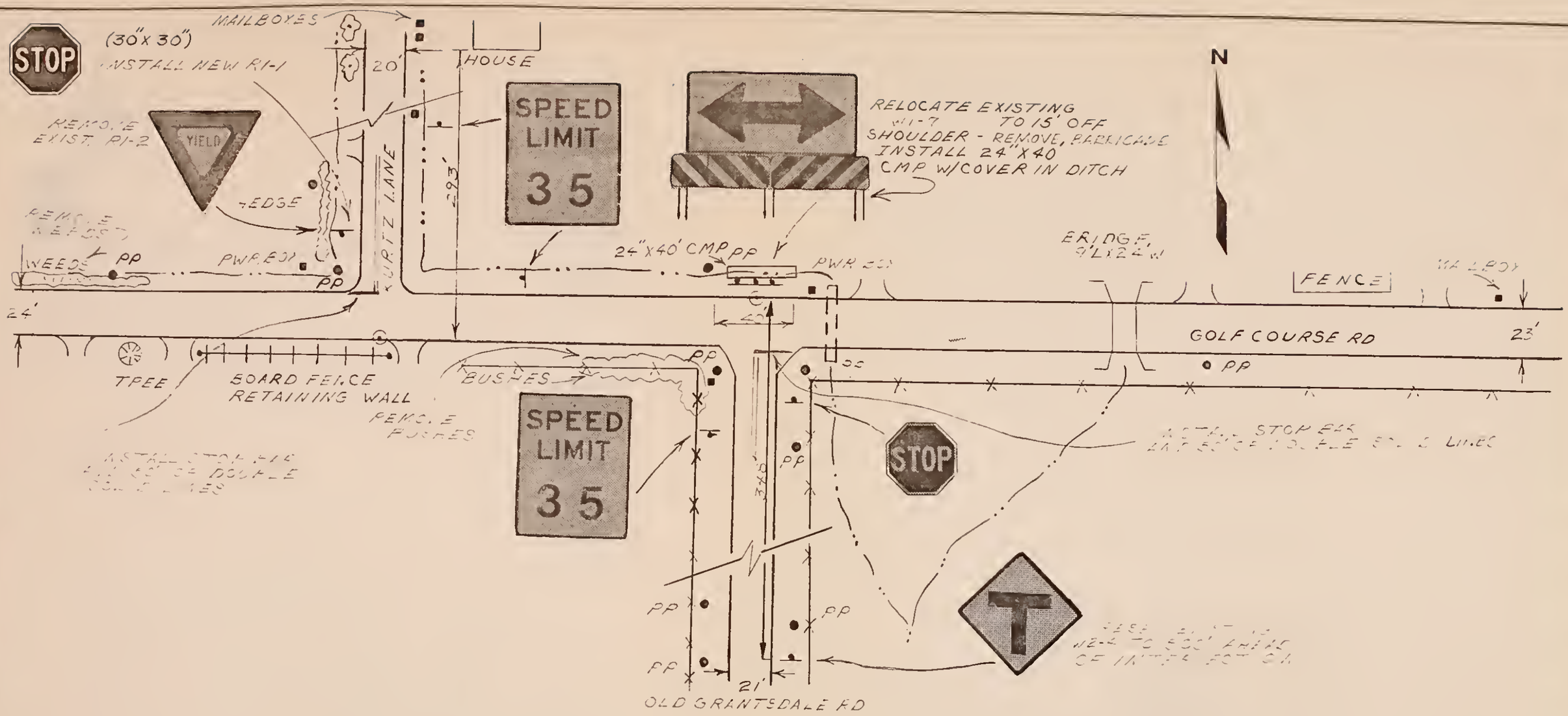
HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

ACCIDENT DIAGRAM
SITE 5

Intersection of Golf Course Road & Old Grantsdale Road

DATE. 10/20/80

PLATE 14



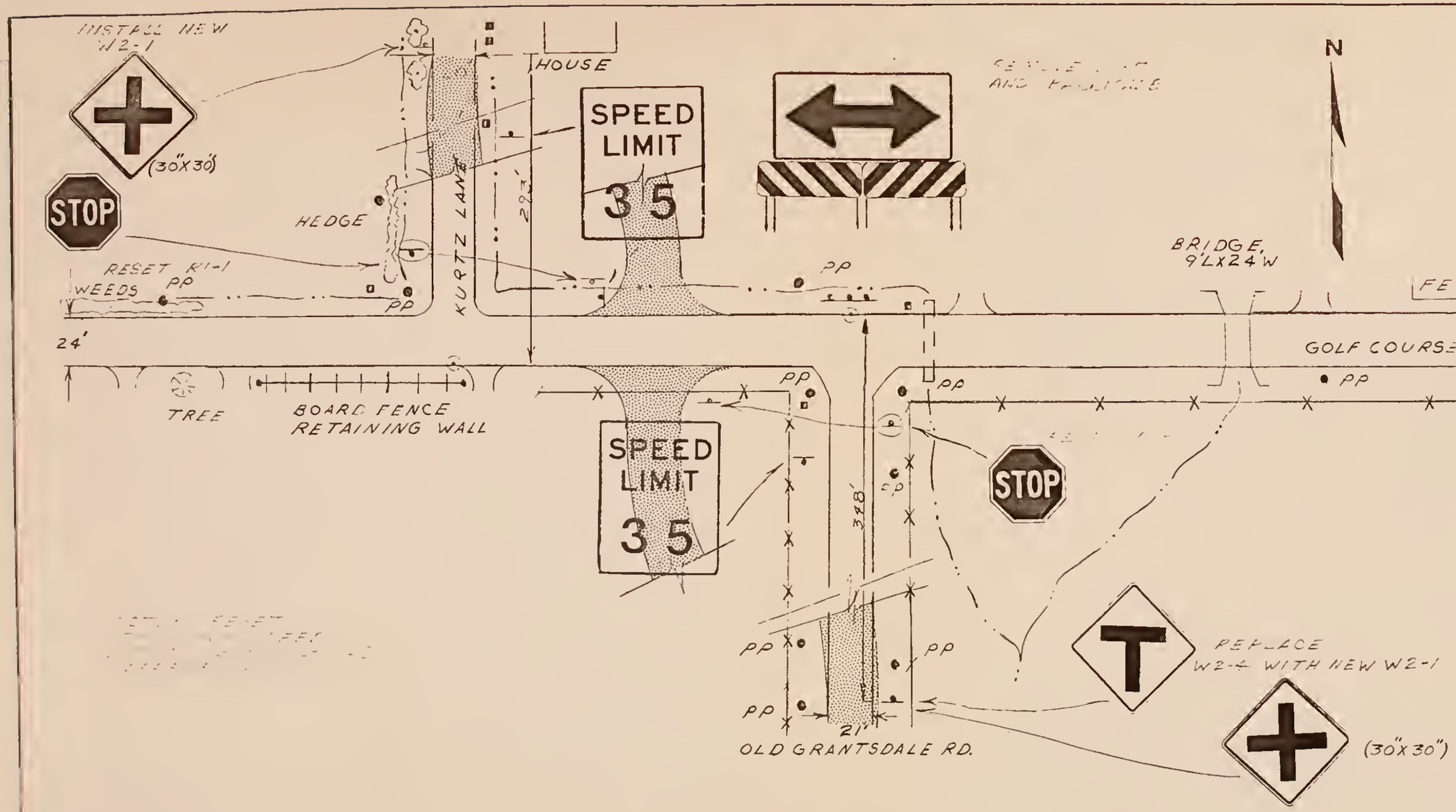
HENNINGSON DURHAM & RICHARDSON INC
HELENA, MONT

IMPROVEMENT DIAGRAM
SITE 5

Intersection of Golf Course Road & Old Grantsdale Road

DATE: 10/20/80

PLATE 15



ULTIMATE IMPROVEMENTS

HENNINGSON DURHAM & RICHARDSON INC
HELENA, MONT

IMPROVEMENT DIAGRAM
SITE 5
Intersection of Golf Course Road & Old Grantsdale Road

DATE 10/20/80 PLATE 15A

SITE NO. 6

Location

Site No. 6 is the intersection of Bowman Road and Ricketts Road 2½ miles northwest of Hamilton.

Description

At this intersection, Ricketts Road and the east leg of Bowman Road is the through road. The intersection is a modified tee; with a curved roadway having been added between the south and east legs to facilitate the through movements. The east and west legs are not controlled, and the south leg is controlled by yield signs at both junctions. All roads are paved.

Bowman Road is on a -2.3%± grade west to east, and Ricketts Road is on a +6.6%± grade on the through leg, and +12.2%± on the tie to the west through leg of Bowman Road. Sight distance on the east leg is restricted by the vertical grade difference, and is also restricted on the inside of the horizontal curve by trees. ADT is 1,710 vehicles.

Accident History

There have been three reported accidents at this location. One vehicle failed to negotiate the curve, one vehicle slid backwards on ice when stopped on the steep (+12.2%±) grade, and a third vehicle collided with a cow immediately west of the intersection.

Evaluation

This site is hazardous due to poor sight distance and a poorly marked intersection. Conflicts between opposing lanes of traffic are probable because of lack of control.

Recommendations

- Install modified Side Road signs (W2-3) on each curve approach 750' in advance of the curve
- Remove the yield sign on the westbound leg of Ricketts Road and replace with a Stop sign (R1-1)
- Remove the yield sign on the eastbound leg of Ricketts Road and reset to the eastbound leg of Bowman Road
- Install a yield sign (R1-2) on the southbound approach of Ricketts Road
- Reset the turn sign and speed plate on the west leg of Ricketts Road to 750' in advance of the turn
- Remove the power pole located in the gore area of the south approach. Trim the trees (or remove as appropriate) on the inside of the curve to improve sight distance
- Widen the through leg to 24'
- Install a double solid centerline around the curve

A long term recommendation is to realign the west approach into a standard T intersection.

Estimated cost of interim improvements: $3,900
Estimated cost of ultimate improvements: $12,840

N

1150'

690'

PWR. BOX

PP

STEEP BANK

PP

PRIVATE DR. GRAVEL

BOWMAN RD.

TREES

PP

SPEED LIMIT 35

YIELD

TREES

YIELD

15 M.P.H.

POST BROKEN SIGN NOT VISIBLE

PP

TREES

41'

FARM EXTRANCES DIRT

90'

PP

MAILBOX

TREES

RICKETTS RD.

-2.3% 1 BOWMAN RD (244')

PROFILE (NOT TO SCALE)

710

1650

1050

TRAFFIC VOLUME (ADT)

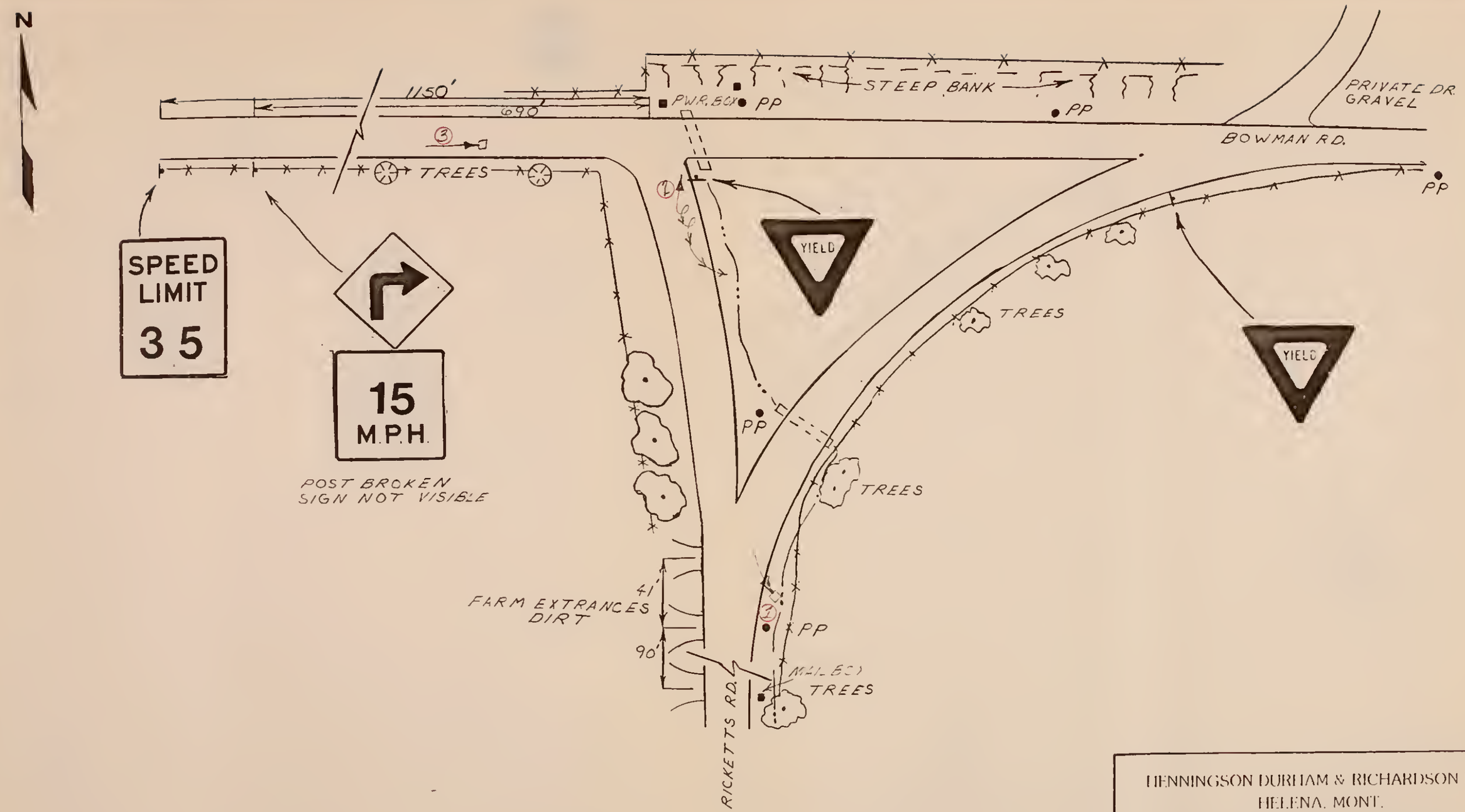
HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

CONDITION DIAGRAM
SITE 6

Intersection of Bowman Road & Ricketts Road

DATE: 10/20/80

PLATE 16



ACCIDENTS							
NO.	DAY	DATE	TIME	WEATHER	ROAD CONDITION	DAY / NIGHT	INJ. / P.D.
1	Wed.	6-08-77	10:30	Clear	Dry	Day	P.D.
2	Fri.	12-30-77	15:15	Snowing	Icy	Day	P.D.
3	Sat.	2-28-76	20:30	Clear	Dry	Night	P.D.

HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

ACCIDENT DIAGRAM
SITE 6

Intersection of Bowman Road & Ricketts Road

DATE: 10/20/80

PLATE 17

N

INSTALL NEW R1-1

STOP (30"x 30")

1150'

690'

PWR BOX PP

PP

STEEP BANK

PRIVATE DR. GRAVEL

BOWMAN RD.

750'

PP

BOWMAN RD.

TREES

REMOVE AND RESET EXISTING R1-2

YIELD

REMOVE AND RESET POWER POLE

PP

TREES

TRIM OVERHEAD LINES

SPEED LIMIT 35

15 MPH

RESET EXISTING FOR W.B.

POST BROKEN SIGN NOT VISIBLE

TREES

INSTALL DOUBLE SOLID ℄

41'

FARM EXTRANCES DIRT

90'

PP

MAILBOX

TREES

RICKETTS RD.

75'

INSTALL NEW W2-3

(30"x 30")

REMOVE AND RESET EXISTING R1-2

YIELD

INSTALL NEW R1-2

(30"x 30")

HENNINGSON DURHAM & RICHARDSON INC
HELENA, MONT

IMPROVEMENT DIAGRAM
SITE 6

Intersection of Bowman Road & Ricketts Road

DATE: 10/20/80

PLATE 18

N

1150'

690'

STEEP BANK

PP

PP

PRIVATE DR GRAVEL

BOWMAN RD.

TREES

PP

(30"X30")

SPEED LIMIT 35

OR W3-1A

STOP AHEAD

(30"X30")

15 MPH

POST BROKEN SIGN NOT VISIBLE

STOP

(30"X30")

TREES

INSTALL NEW W1-6 (INTERVALS DETERMINED IN FIELD)

REMOVE W2-3 AND INSTALL W2-2

PP

TREES

FARM EXTRANCES DIRT

41'

90'

PP

TREES

RICKETTS RD.

(30"X30")

ULTIMATE IMPROVEMENTS

HENNINGSON DURHAM & RICHARDSON INC
HELENA, MONT

IMPROVEMENT DIAGRAM
SITE 6

Intersection of Bowman Road & Ricketts Road

DATE 10/20/80

PLATE 18 A

SITE NO. 8

Location

This 1.2 mile segment is a portion of the Victor Crossing Road east of Victor between U.S. 93 and FAS 269.

Description

The segment contains six narrow bridges along its length. Three bridges are in close proximity to each other, with a horizontal curve between the second and third bridge. Site distance is impaired at several of the bridges by the curves on the approaches and by the bridge deck being higher than the approaches. The second most easterly bridge is an overhead truss structure 14' wide which is signed for one lane, and has been closed to traffic since November 1979 because of damage sustained from a vehicular accident. The roadway is paved, and roadway widths vary from 18' to 22'. Estimated ADT is 310 vehicles.

Accident History

There have been four reported accidents along this segment; all were single vehicle at night and resulted in injuries. Three of the four accidents involved striking a bridge.

Evaluation

This segment is hazardous because of the restricted sight distance and poor alignment of the several narrow bridges.

Although several accidents occurred on the bridges, only one appears to be a bridge-created hazard.

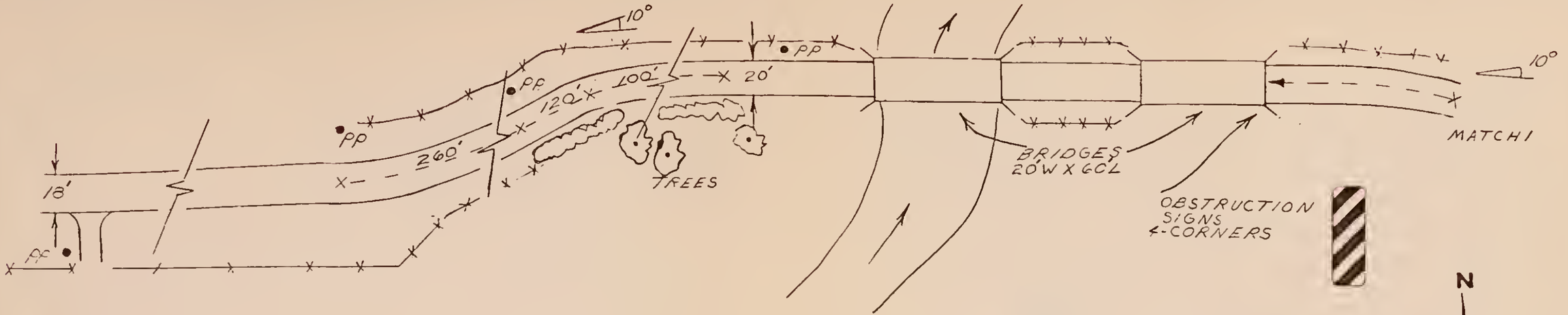
Recommendations

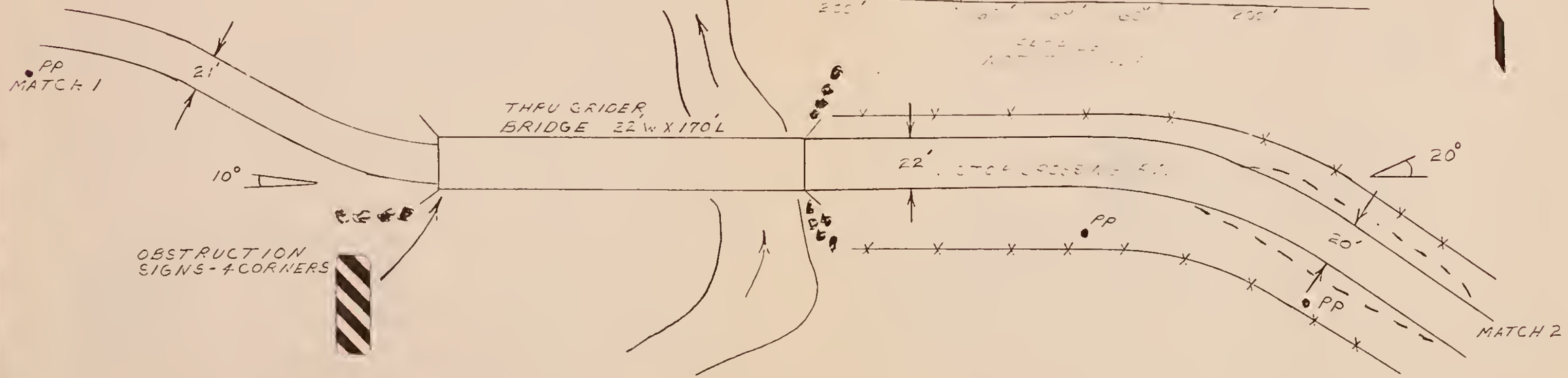
- Install obstruction markers (X1-1) on all bridge ends
- Install a Reverse Curve sign (W1-4) 750' in advance of the reverse curves on the west end of the segment
- Remove the bushes west of the westernmost bridge
- Install Design "C" Type II bi-directional delineators at 50' spacings as shown

A long term recommendation is to realign the section of roadway at the western end of the study segment. New, wider bridges or large pipes should be installed, and the vertical alignment adjusted. Included in the long term recommendations is vertical alignment adjustments to the approaches at the long truss bridge near the east end of the segment to improve sight distance across the bridge. Replacement or repair of this bridge would afford an apportune time to effect these recommendations.

Estimated cost of interim improvements: $720

Estimated cost of ultimate improvements: $202,740





HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

CONDITION DIAGRAM
SITE 8

Victor Crossing Road

DATE: 10/20/80

PLATE 19(A)

MATCH 2

90°

PP

20'

PP

20°

PP

19.5' X 98' L

MATCH 3

900'

PP

CESTRUCTION SIGN

N

MATCH 3

10°

235'

OBSTRUCTION SIGNS - 4 CORNERS

ONE LANE BRIDGE

14' W X 155' L OVERHEAD
N.S. VERTICALS BROKEN

OBSTRUCTION SIGNS - 3 CORNERS

ONE LANE BRIDGE

395'

PP 10°

-1.0% ± (100)'

+2.6% ± (50)'

+2.4% ± (50)'

PROFILE

-2.6% ± (100)'

-2.2% ± (50)'

+2.6% ± (50)'

NO TO SCALE

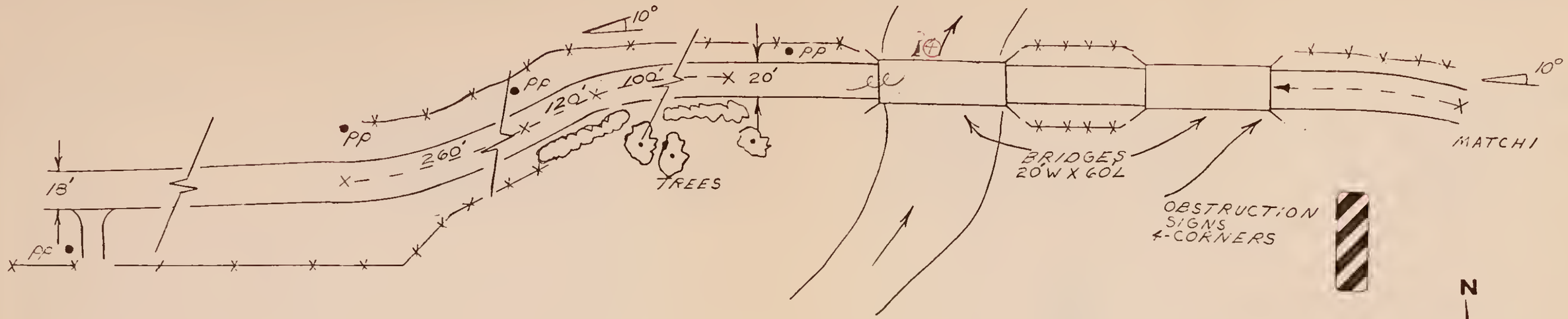
HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

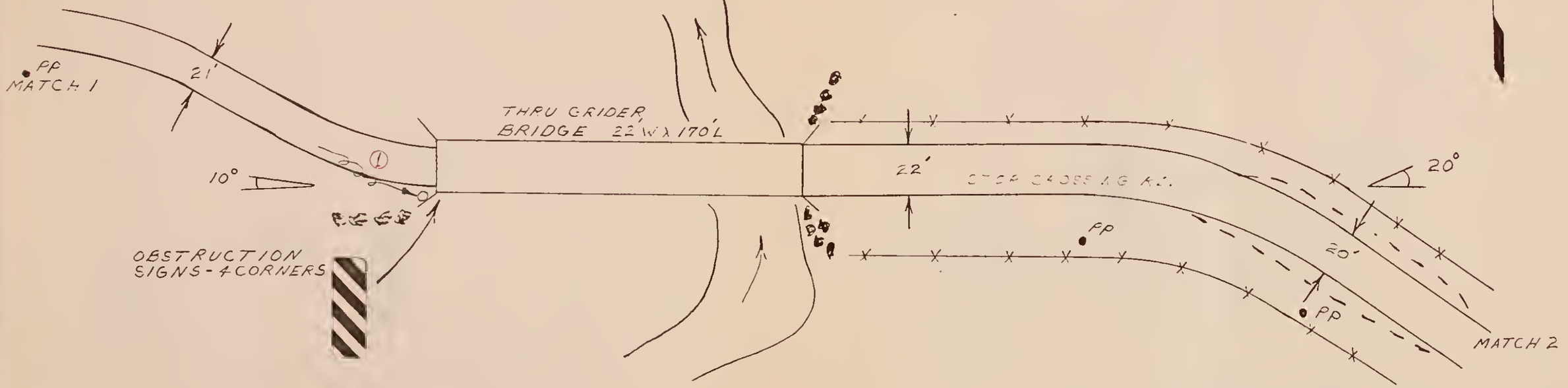
CONDITION DIAGRAM
SITE 8

Victor Crossing Road

DATE: 10/20/80

PLATE 19(B)





ACCIDENTS							
NO.	DAY	DATE	TIME	WEATHER	ROAD CONDITION	DAY / NIGHT	INJ. / P.D.
1	Mon.	3-01-76	22:40	Clear	Icy	Night	1-Inj.
2	Wed.	7-14-76	23:00	Clear	Dry	Night	1-Inj.
3	Fri.	11-23-79	22:56	Clear	Icy	Night	3-Inj.
4	Tues.	2-06-77	20:20	Clear	Dry	Night	1-Inj.

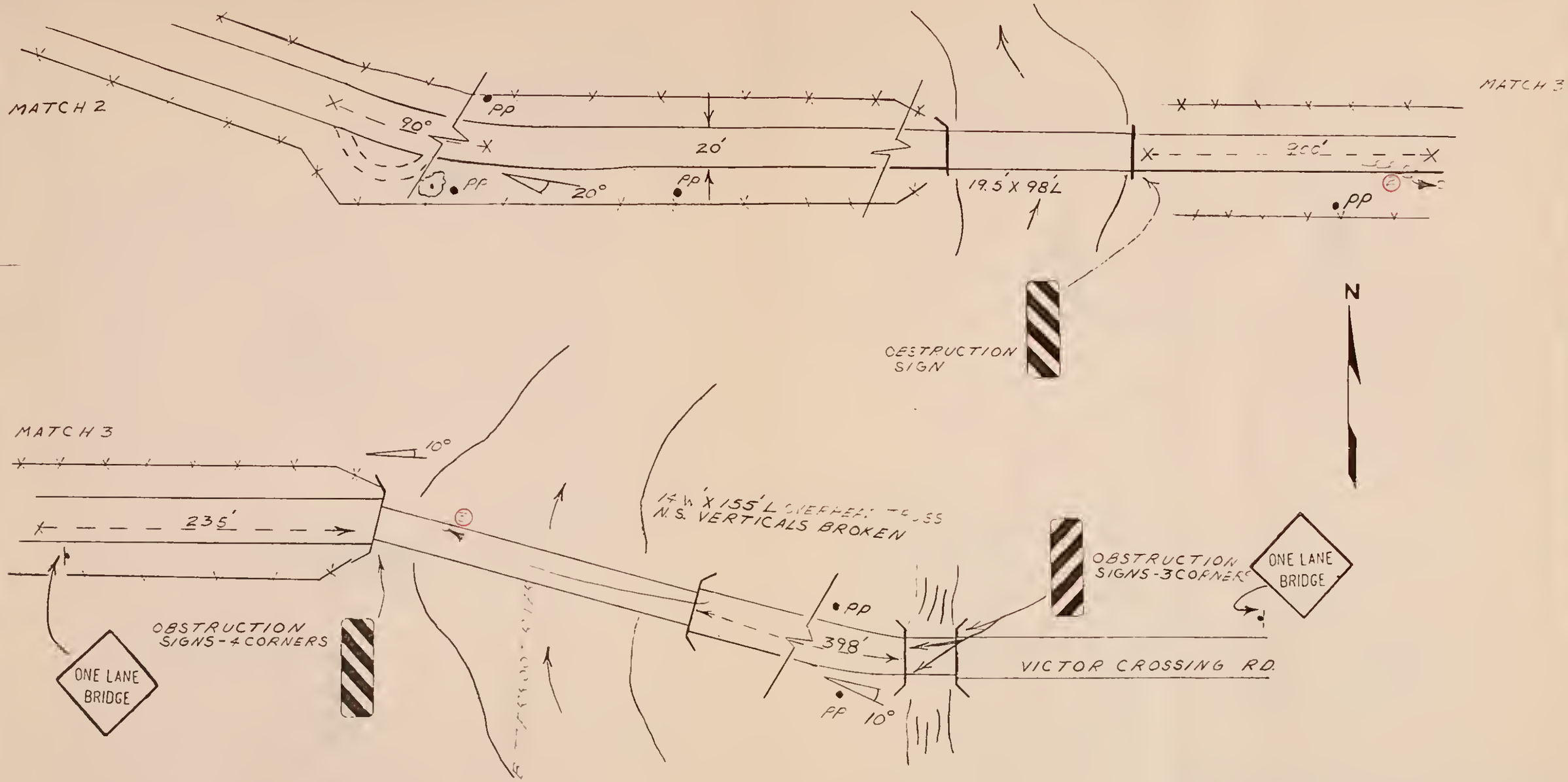
HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

ACCIDENT DIAGRAM
SITE 8

Victor Crossing Road

DATE: 10/20/80

PLATE 20(A)



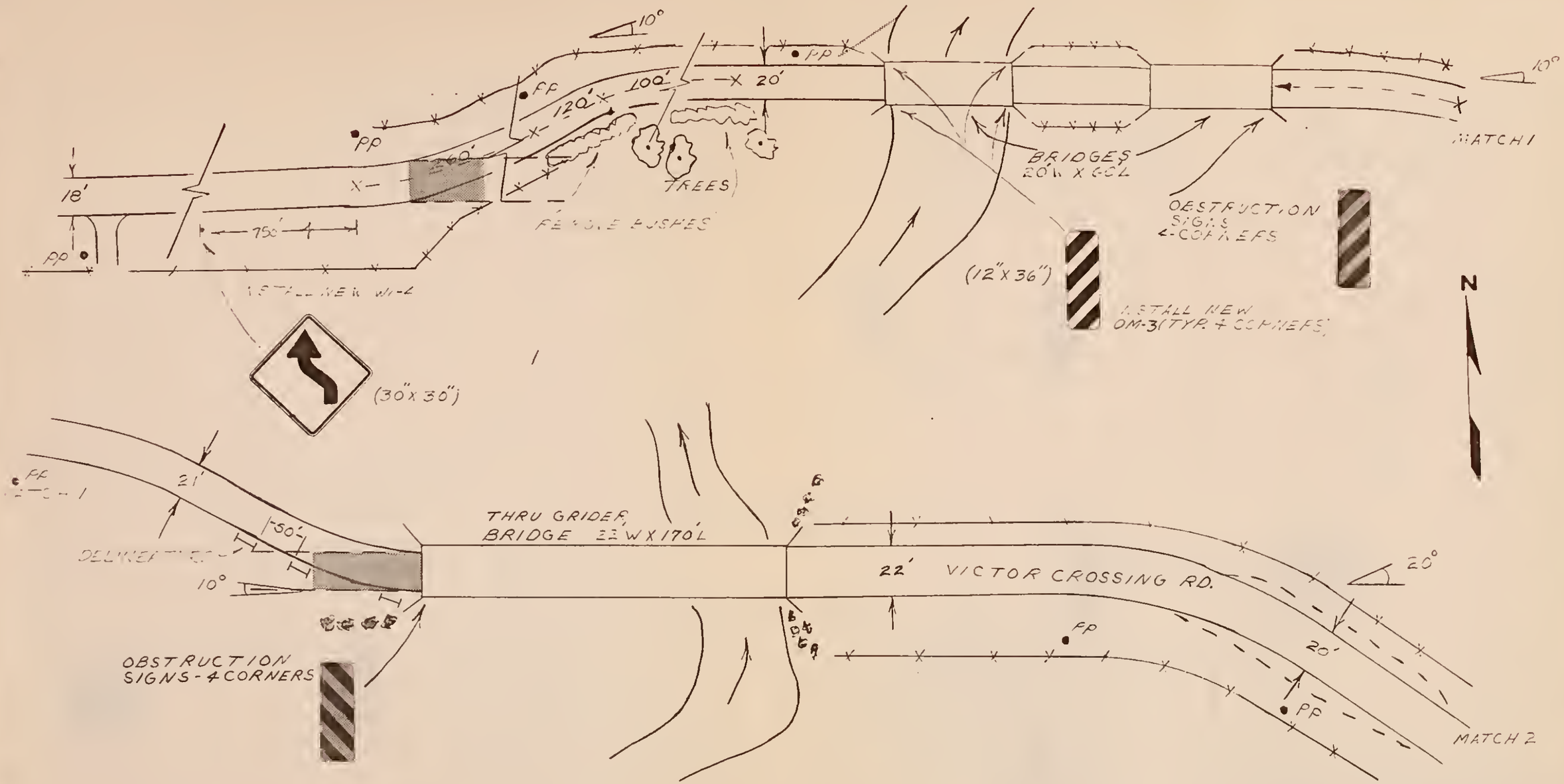
HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

ACCIDENT DIAGRAM
SITE 8

Victor Crossing Road

DATE: 10/20/80

PLATE 20(B)



NOTE: ULTIMATE IMPROVEMENTS ARE TO REALIGN ROADWAY AND REPLACE EXISTING BRIDGES

NOTE: INSTALL DELINATORS @ 50' c/c

HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

IMPROVEMENT DIAGRAM
SITE 8

Victor Crossing Road

DATE: 10/20/80

PLATE 21(A)

MATCH 2

90°

PP

20'

PF

20°

FP

19.5' x 95'L

MATCH 3

200'

F.P.

INSTALL NEW OM-3 (12"x36")

OBSTRUCTION SIGN

N

MATCH 3

10°

235'

OBSTRUCTION SIGNS - 4 CORNERS

ONE LANE BRIDGE

14 W x 155'L OVERHEAD TRUSS
N.S. VERTICALS BROKEN

PP

235'

PF 10°

OBSTRUCTION SIGNS - 3 CORNERS

ONE LANE BRIDGE

VICTOR CROSSING RD.

INSTALL NEW OM-3

(12"x36")

NOTE: ULTIMATE IMPROVEMENT IS TO REDUCE VERTICAL OFFSET TO APPROACHES ON OVERHEAD TRUSS BRIDGE.

HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

IMPROVEMENT DIAGRAM
SITE 8

Victor Crossing Road

DATE: 10/20/80

PLATE 21(B)

SITE NO.9

Location

Site No. 9 is a 3,400' segment of the east end of Pine Hollow Road, and is located about 1½ miles south and 2½ miles west of Stevensville.

Description

The segment is characterized by a 16' to 20' paved roadway, with a long steep hill (1600' of 6%±, with sections greater than 10%) at the north end and several sharp curves. Sight distance is limited to 130' around one curve because of a residence and yard located on the inside of the curve; sight distance around another curve located on the crest of a hill is limited because of trees and a steep bank to the inside of the curve. Several locations have trees within six feet of the roadway edge. Signing is limited to turn warning signs at the southern end of the segment, and a non-standard school crossing sign in poor condition. ADT is 530 vehicles.

Accident History

There have been four reported accidents on this segment. One was a two vehicle collision at a curve on the crest of a hill. Three were at night and three were on a wet, icy or snowy roadway.

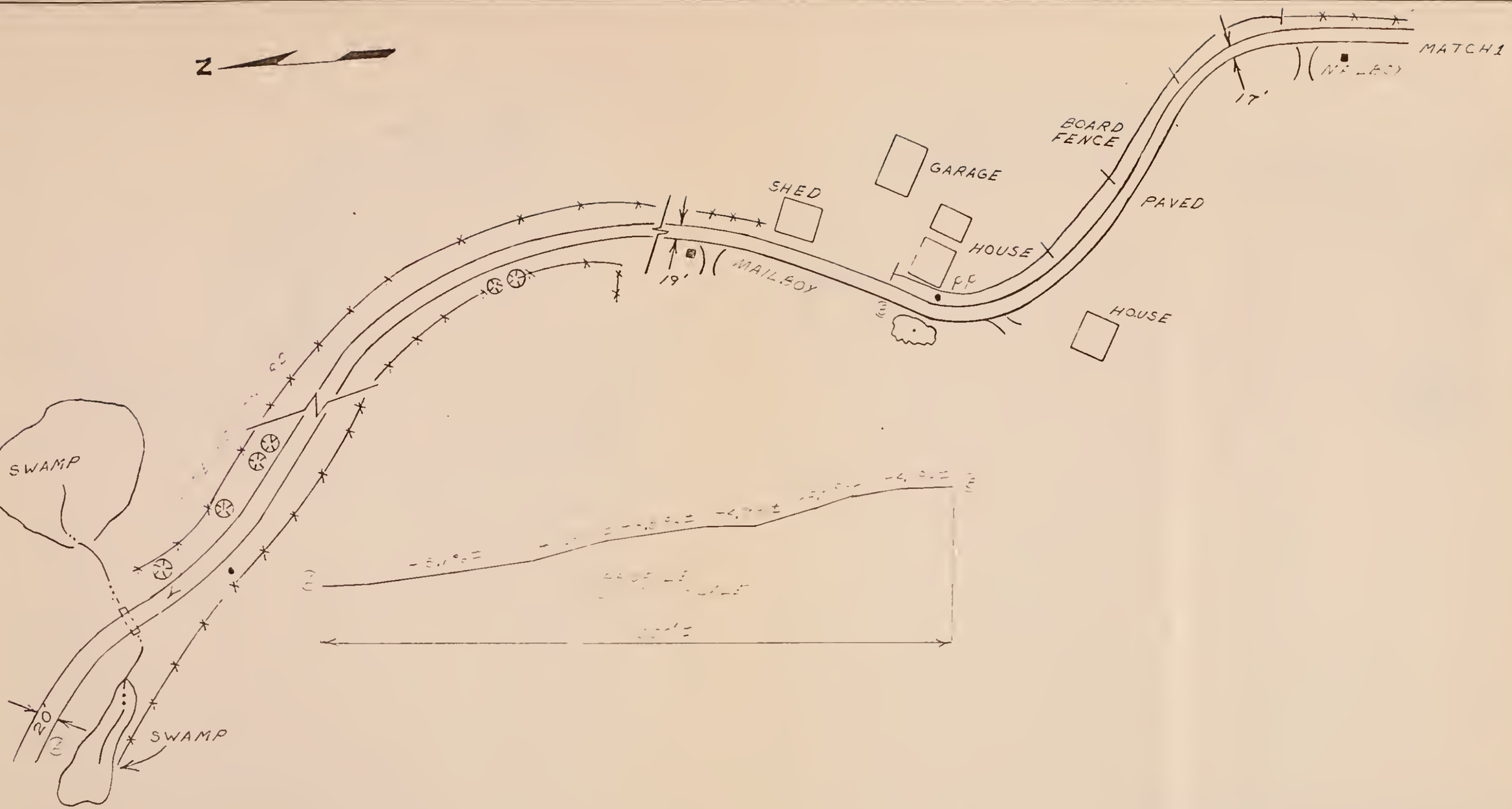
Evaluations

This segment is similar to the preceding roadway when approaching from the north, but dissimilar when approaching from the south. The steep grade at the north end effectively limits approach speed.

Recommendations

- Install 20 mph advisory speed plates (W13-1) on the existing turn signs at the south end of the segment.
- Install a turn sign (W1-1) on the south approach to the crest curve 350' in advance of the curve.
- Remove the non-standard school warning sign.
- Remove the trees along the north side of the north end of the segment.
- Reset the southern existing turn sign (W1-1) to 500' in advance of the curve.

Estimated cost: $440



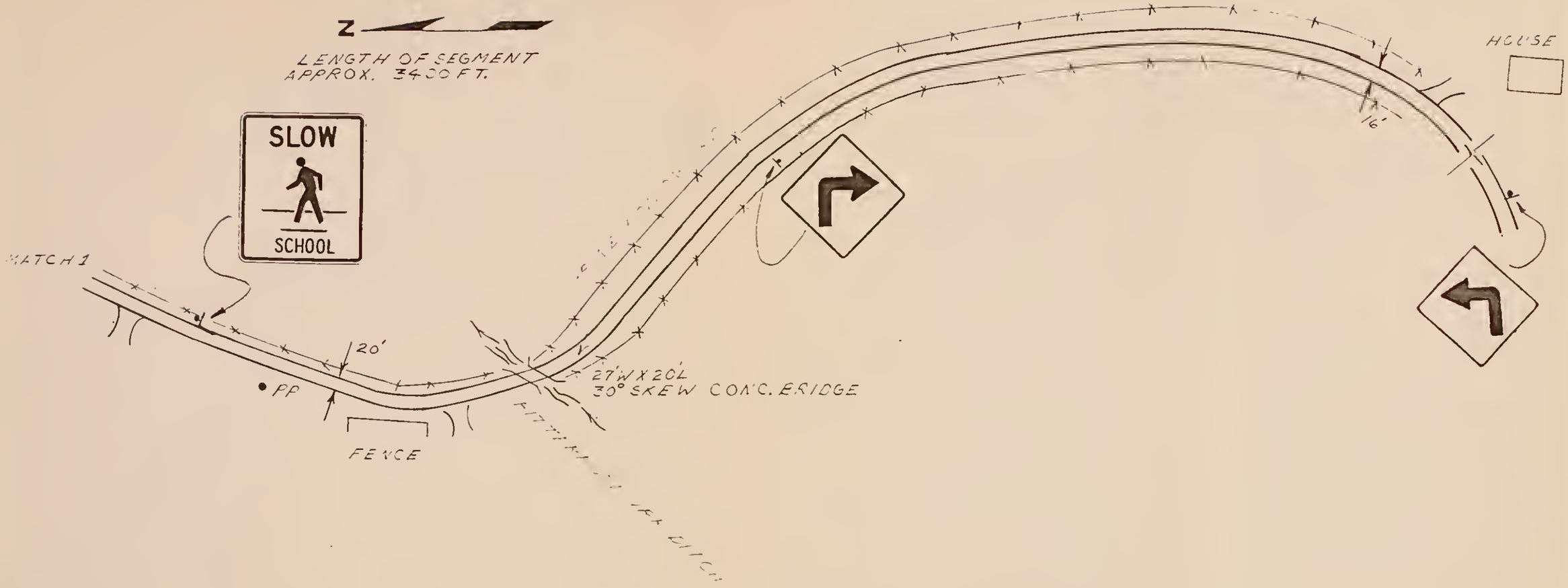
HENNINGSON DURHAM & RICHARDSON INC
HELENA, MONT.

CONDITION DIAGRAM
SITE 9

East end of Pine Hollow Road

DATE: 10/20/80

PLATE 22(A)



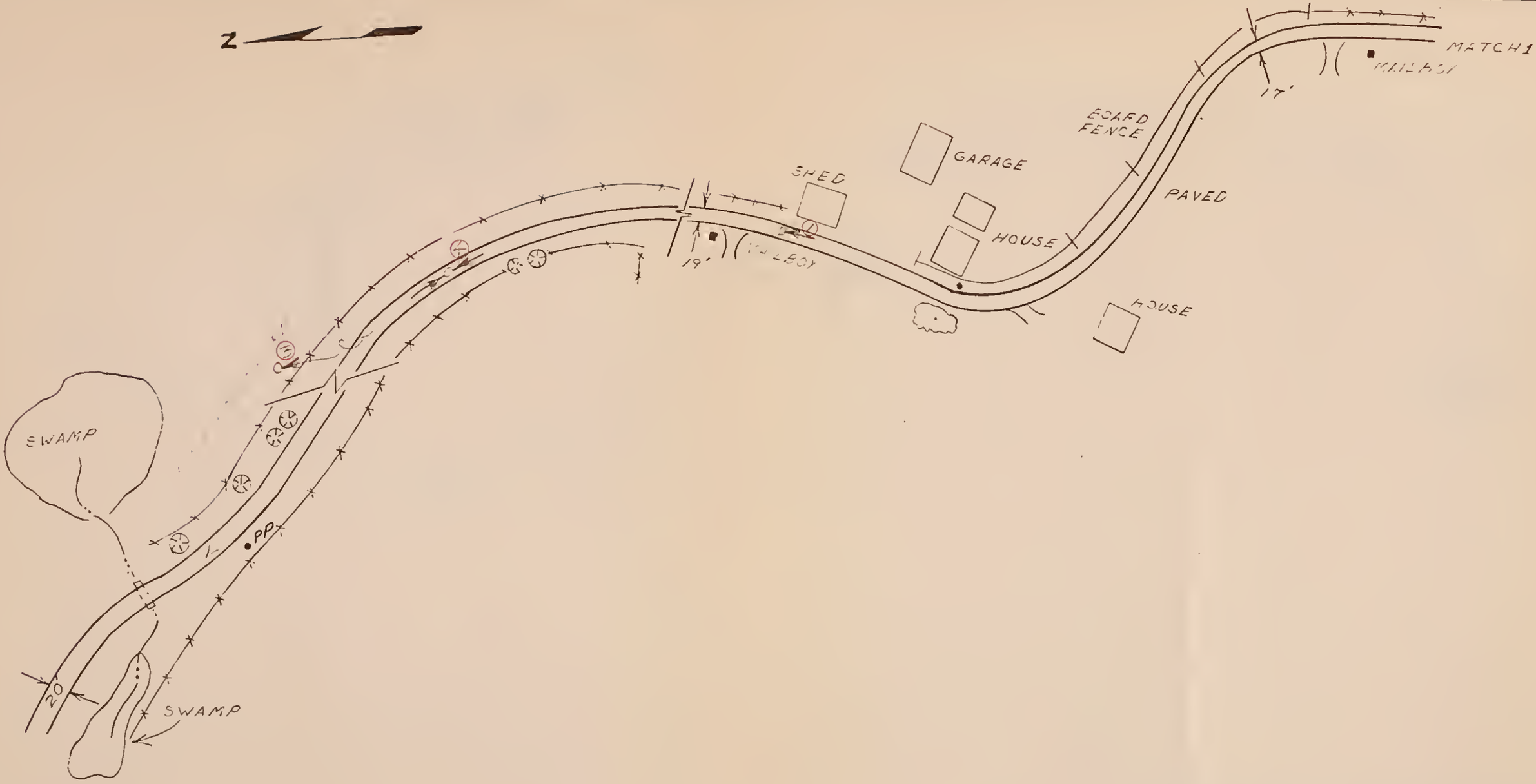
HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

CONDITION DIAGRAM
SITE 9

East End of Pine Hollow Road

DATE: 10/20/80

PLATE 22(B)



ACCIDENTS							
NO.	DAY	DATE	TIME	WEATHER	ROAD CONDITION	DAY / NIGHT	INJ. / P.D.
1	Tues.	11-08-77	18:30	Clear	Dry	Night	P.D.
2	Weds.	11-08-78	18:10	Raining	Wet	Night	P.D.
3	Sun.	1-08-77	21:30	Clear	Icy	Night	3-Inj.
4	Mon.	11-13-78	16:40	Clear	Snow	Day	1-Inj.

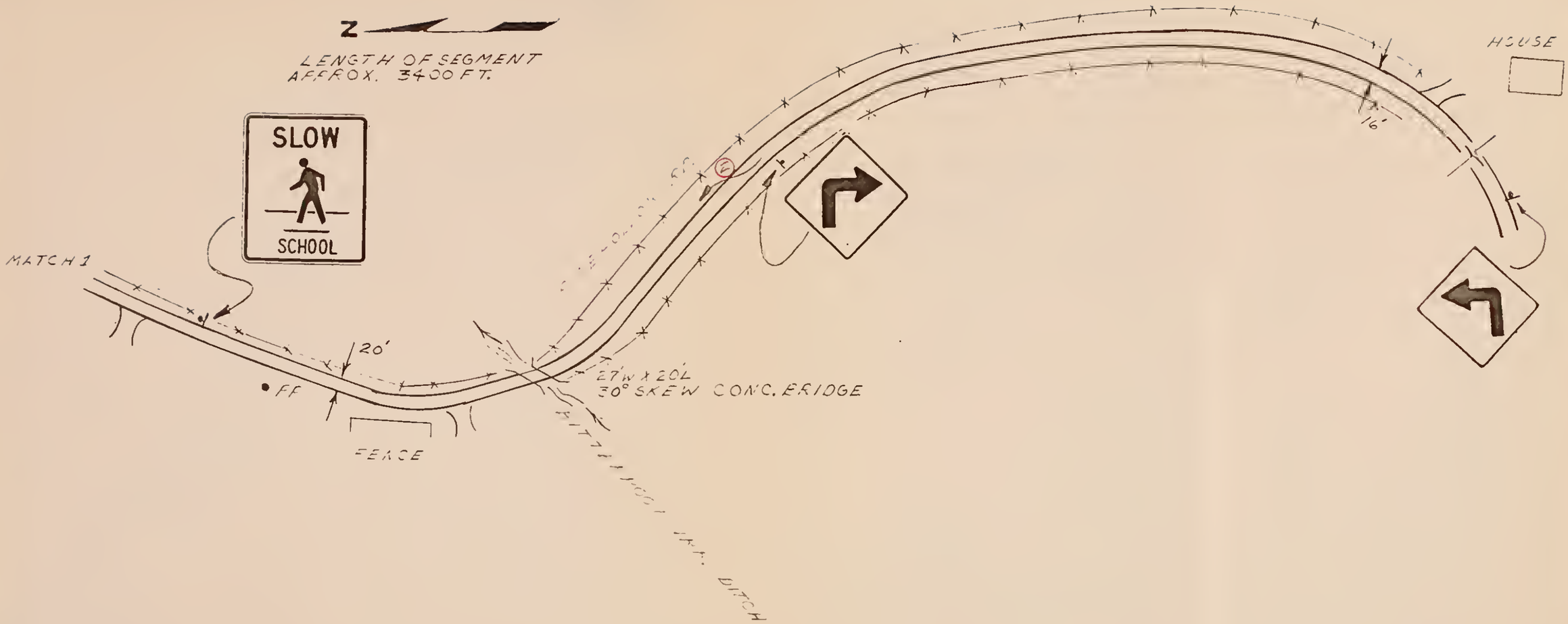
HENNINGSON DURHAM & RICHARDSON INC
HELENA MONT

ACCIDENT DIAGRAM
SITE 9

East end of Pine Hollow Road

DATE: 10/20/80

PLATE 23 (A)



HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

ACCIDENT DIAGRAM
SITE 9

East End of Pine Hollow Road

DATE: 10/20/80

PLATE 23 (B)

HENNINGSON DURHAM & RICHARDSON INC
HELENA, MONT.

IMPROVEMENT DIAGRAM
SITE 9

East end of Pine Hollow Road

DATE: 10/20/80

PLATE 24(A)

HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

IMPROVEMENT DIAGRAM
SITE 9

East End of Pine Hollow Road

DATE: 10/20/80

PLATE 24 (8)

SITE NO. 10

Location

Site No. 10 is the intersection of Middle Burnt Fork Road and Logan Lane, one mile west of Stevensville.

Description

This site is a standard four-legged intersection. All legs are paved and 21' wide, with the north leg being 23' wide. Middle Burnt Fork Road is the through road, and Logan Lane is stop controlled. Sight distance is good on all legs except the east leg when viewed from the south. A swampy area with cattails along the roadway limits the sight distance to about 300'. ADT is 1850 vehicles.

Accident History

There have been five reported accidents at this location. Three were two-vehicle angle accidents, two from the north leg and one from the south leg. All accidents were on dry pavement, and three were during the day.

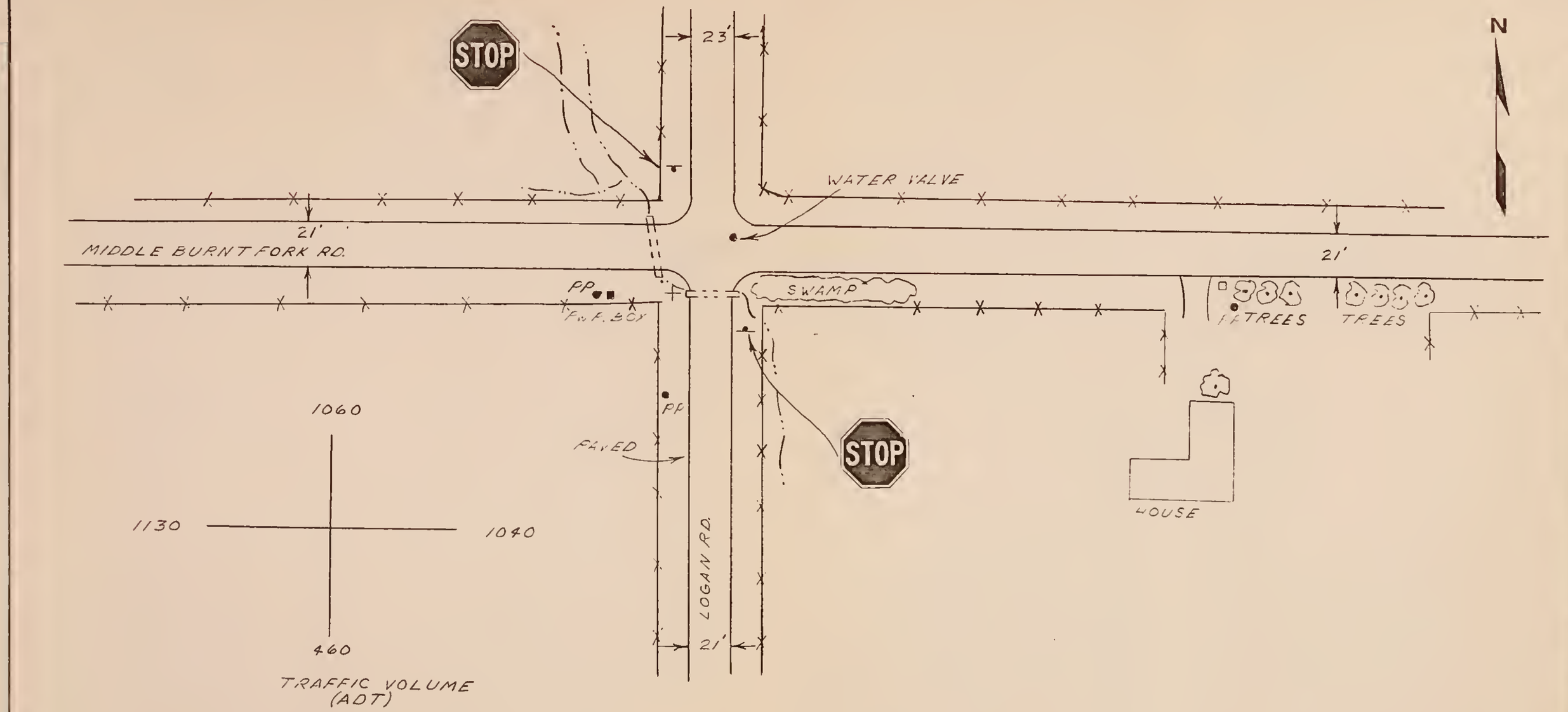
Evaluation

This intersection is not anticipated when travelling in an east-west direction. During the site survey, the survey members observed vehicles on the north and south approaches failing to stop, although the stop signs are visible well in advance of the intersection.

Recommendations

- Install Cross Road signs (W2-1) on the east and west approaches 750' in advance of the intersection.
- Remove the swamp cattails along the south side of the east approach.
- Install Stop Ahead signs (W3-1) on the north and south approaches 750' in advance of the intersection.
- Install stop bars and double solid lines (50') on the north and south approaches.

Estimated cost: $630



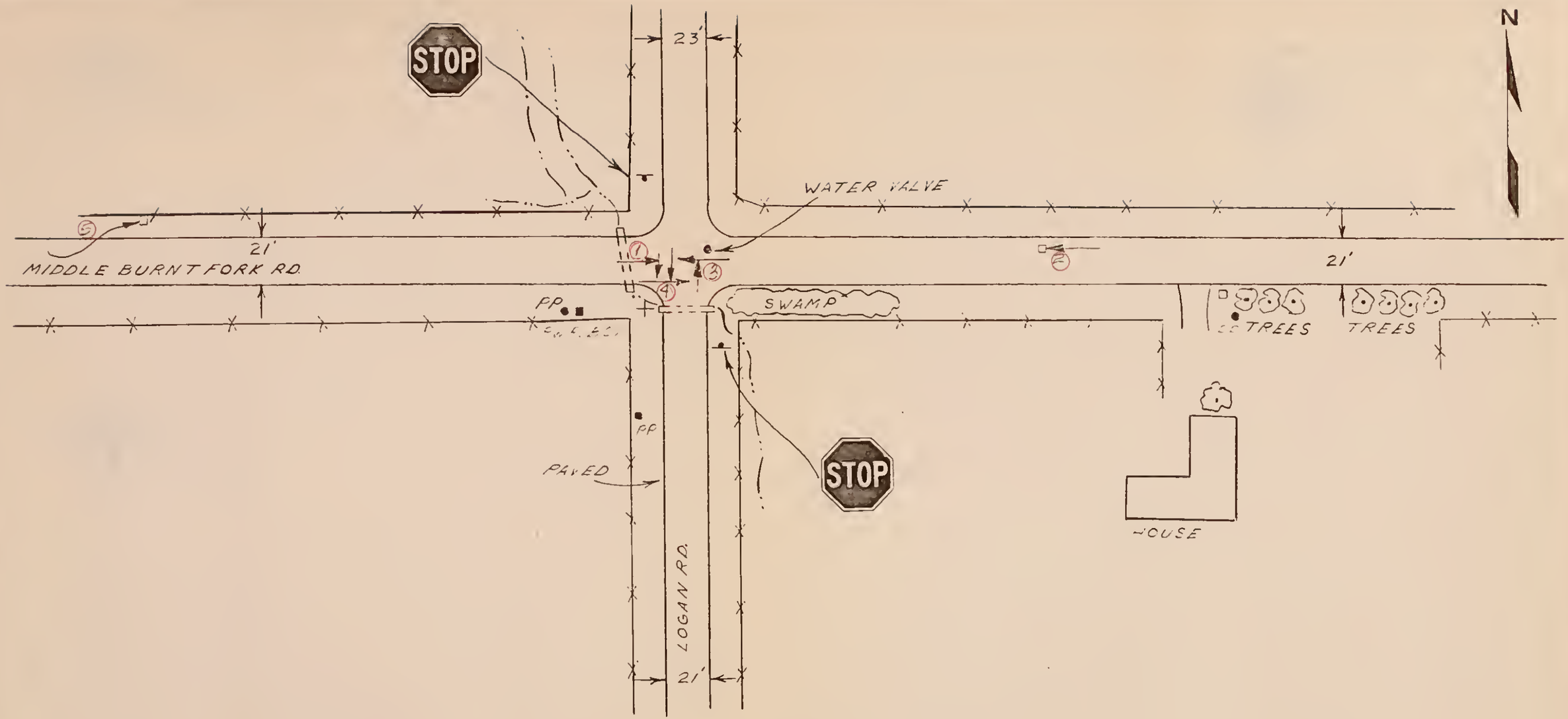
HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

CONDITION DIAGRAM
SITE 10

Intersection of Middle Burnt Road &
Logan Road

DATE: 10/20/80

PLATE 25



ACCIDENTS							
NO.	DAY	DATE	TIME	WEATHER	ROAD CONDITION	DAY / NIGHT	INJ. / P.D.
1	Tues.	5-15-79	19:10	Clear	Dry	Day	P.D.
2	Sun.	5-27-79	23:30	Clear	Dry	Night	P.D.
3	Sun.	10-07-78	17:30	Clear	Dry	Day	P.D.
4	Tues.	5-01-79	10:15	Clear	DRy	Day	2-Inj.
5	Sat.	12-08-78	02:10	Clear	Dry	Night	P.D.

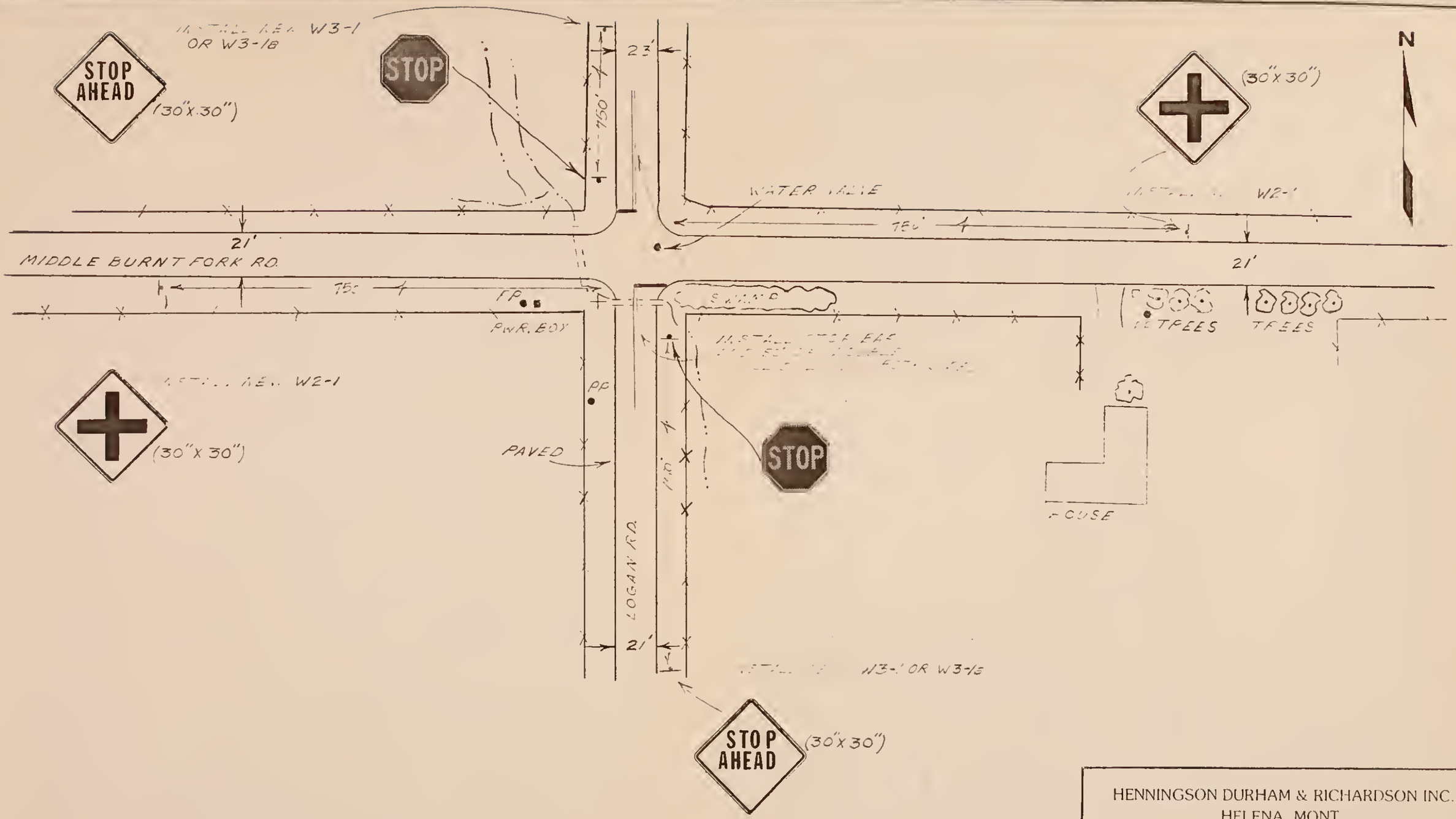
HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

ACCIDENT DIAGRAM
SITE 10

Intersection of Middle Burnt Road & Logan Road

DATE: 10/20/80

PLATE 26



HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

IMPROVEMENT DIAGRAM
SITE 10

Intersection of Middle Burnt Road &
Logan Road

DATE: 10/20/80

PLATE 27

SITE NO. 11

Location

Site No. 11 is a 4,800' segment of Middle Burnt Fork Road beginning at the intersection of North Burnt Fork Road and Middle Burnt Fork Road. This segment begins four miles west of Stevensville.

Description

Middle Burnt Fork Road is a 24' wide paved roadway with several approaches along the segment, the major ones being the intersection of North Burnt Fork Road and the entrance to the Iron Cap Ranches, a 63-lot 1,280 acre subdivision. There are several curve warning signs with advisory speed plates along the segment. There is no control at the North Burnt Fork intersection and stop control at the Iron Cap Ranches approach. Sight distance is generally good, although limited in isolated locations because of bushes or trees along the roadway. ADT is 720 vehicles.

Accident History

There have been seven reported accidents on this roadway segment. All were single vehicles. All but one accident was on a dry roadway, and three were at night. Six involved out of control vehicles which left the roadway, and the seventh was a collision with a cow.

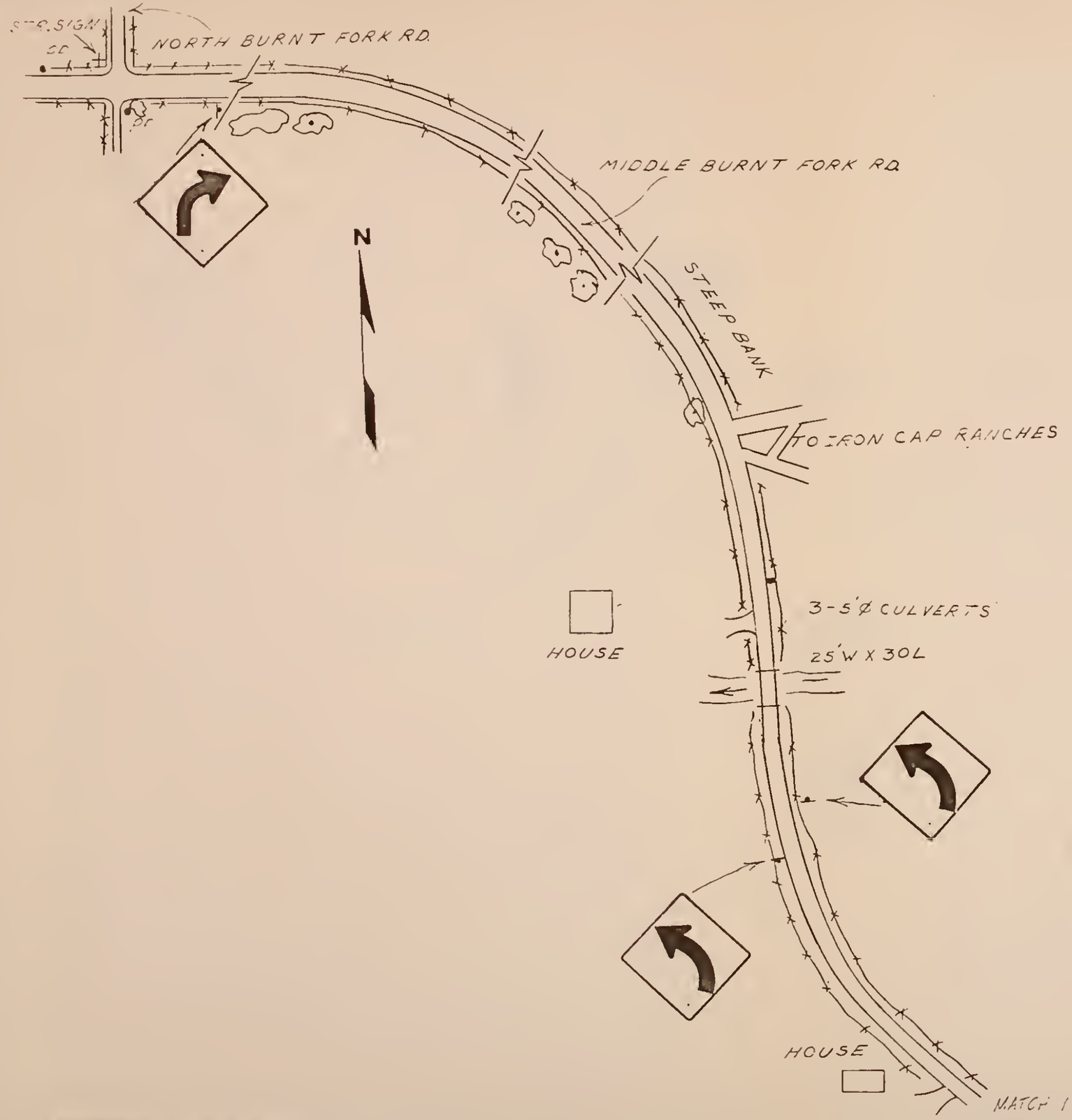
Evaluation

The segment appears to contain no unusual or unexpected situations for this type of roadway. The concrete bridge located at the end of a tangent near the south end of the segment is not well defined on the north approach and is narrower than the approaches. The turn at the south end of the segment cannot be negotiated at the signed speed.

Recommendations

-Remove the 35 mph advisory speed plates and replace with 25 mph advisory speed plates (W13-1)
-Reset the turn warning sign on the south end to 500' in advance of the curve
-Reset the curve warning sign on the north end to 750' in advance of the curve
-Remove the bush at the west bridge abutment, and remove the trees and bush on the inside of the curve at the north end of the segment
-Remove the existing W1-1 and replace with a W1-2

Estimated cost: $540



HENNINGSON DURHAM & RICHARDSON INC
HELENA, MONT

CONDITION DIAGRAM
SITE 11

Intersection of Middle Burnt Fork Road & Burnt Fork Road

DATE: 10/20/80

PLATE 28(A)

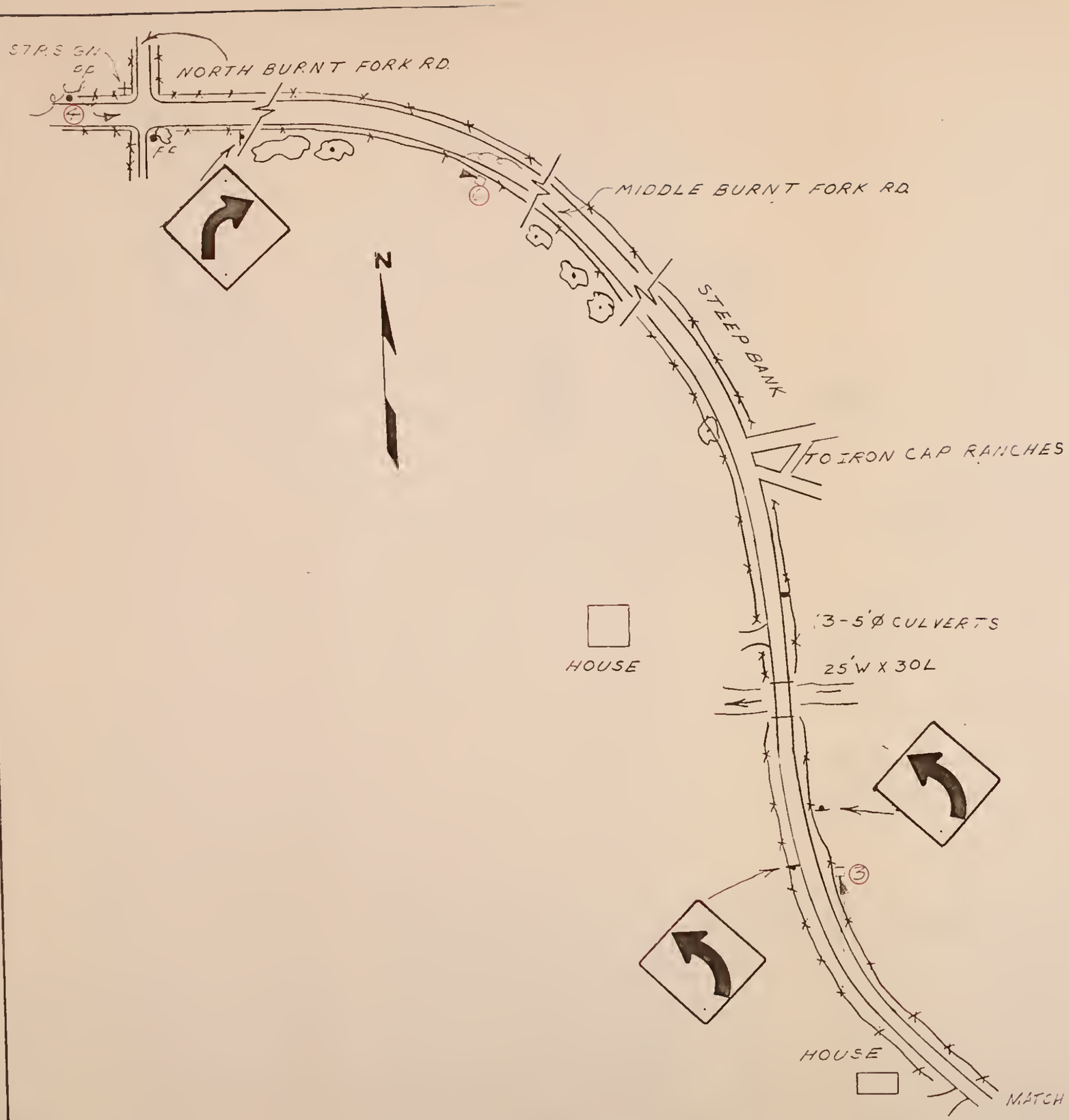
HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

CONDITION DIAGRAM
SITE 11

Intersection of Middle Burnt Fork Road
and North Burnt Fork Road

DATE: 10/20/80

PLATE 28(B)



HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

ACCIDENT DIAGRAM
SITE 11

Intersection of Middle Burnt Fork Road & Burnt Fork Road

DATE: 10/20/80

PLATE 29(A)

ACCIDENTS							
NO.	DAY	DATE	TIME	WEATHER	ROAD CONDITION	DAY / NIGHT	INJ. / P.D.
1	Tues.	8-31-76	10:00	Clear	Dry	Day	P.D.
2	Sat.	9-04-77	00:15	Clear	Dry	Night	1-Inj.
3	Fri.	9-24-78	10:30	Clear	Dry	Day	P.D.
4	Sat.	5-20-78	02:20	Clear	Dry	Night	P.D.
5	Sat.	8-20-78	13:30	Clear	Dry	Day	1-Inj.
6	Sun.	1-07-79	00:15	Clear	Icy	Night	P.D.
7	Tues.	8-07-79	19:00	Clear	Dry	Day	P.D.

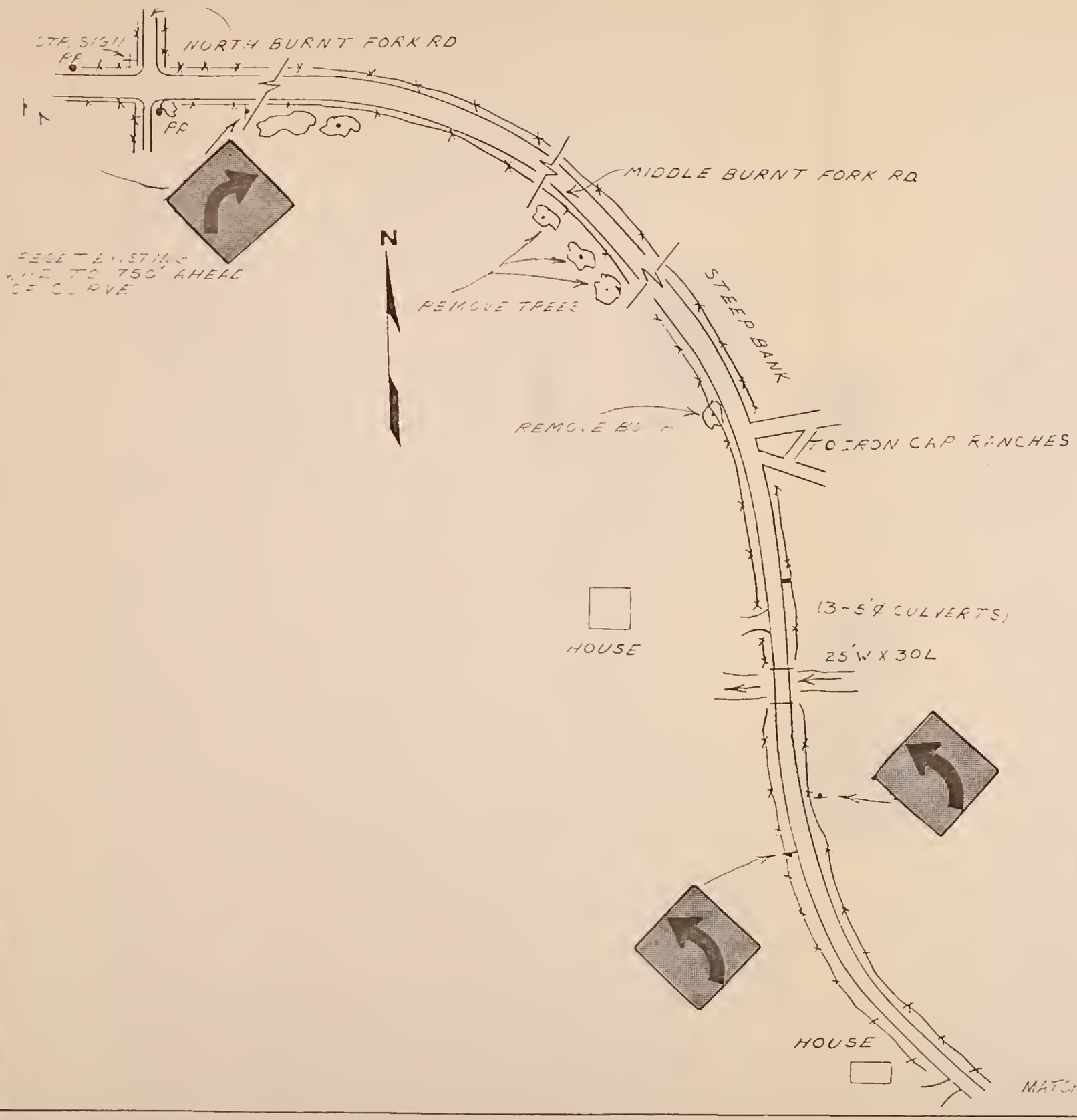
HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

ACCIDENT DIAGRAM
SITE 11

Intersection of Middle Burnt Fork Road and North Burnt Fork Road

DATE: 10/20/80

PLATE 29(B)



HENNINGSON DURHAM & RICHARDSON INC
HELENA, MONT.

IMPROVEMENT DIAGRAM SITE11

Intersection of Middle Burnt Fork Road & Burnt Fork Road

DATE 10/20/80

PLATE30(A)

MATCH 1

PAVED

OBSTR. SIGNS

WEIGHT LIMIT 9 TONS

TYP. 6 CORNERS

TYP. 6 STR. SUPPLIES

REMOVE EXISTING W1-1
REPLACE W/ NEW W1-2

(30"x30")

MIDDLE BURNT FORK RD.

19'W X 50'L
CONC BRIDGE

REMOVE BUSHES

REMOVE EXISTING W13-1
INSTALL NEW W13-1

35 M.P.H.

25 M.P.H.

N

POND

SHED

35 M.P.H.

25 M.P.H.

(18"x18")

HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

IMPROVEMENT DIAGRAM
SITE 11

Intersection of Middle Burnt Fork Road
and North Burnt Fork Road

DATE: 10/20/80

PLATE 30(B)

SITE NO. 13

Location

Site no. 13 is a section of old U.S. 93 approx. 3/4 mile north of Florence. This segment fronts several schools and is intersected by several streets including Tie Chute Lane.

Description

Old U.S. 93 is a 21' wide paved road fronting a grade school/high school complex and a bible school, as well as numerous dirt and gravel approaches and parking areas. In addition, Tie Chute Lane (a 22' wide paved roadway) intersects old U.S. 93 at the northern end of the segment. There are advance school warning signs and speed limit signs at both ends of the segment, as well as school warning signs with flashers at the two school crosswalks across old U.S. 93. Tie Chute Lane and Long Avenue are stop controlled. ADT is 2,375 vehicles.

Accident History

There have been eight reported accidents along this segment, five of which were two-vehicle collisions. Four of the five two-vehicle accidents involved vehicles entering or leaving a driveway or parking area. Half of the accidents were on an icy roadway, and all but two accidents were during the day.

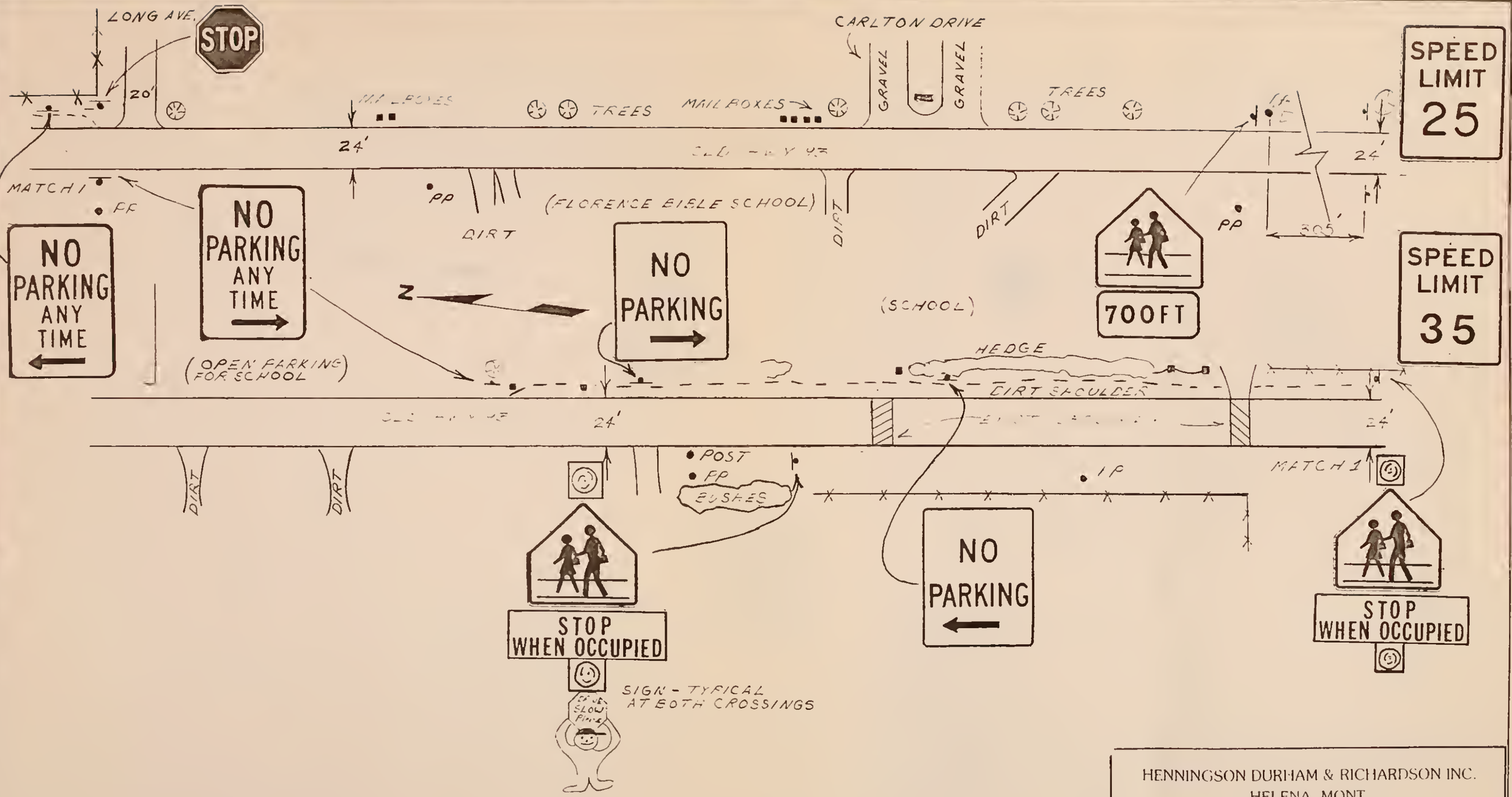
Evaluation

The accidents along this segment were apparently due to driver error, and poor sight distance leaving driveways may have been a contributing factor in some cases. Parking in front of the school should be restricted. Access from the school parking lot should be limited by installation of pin down curbing.

Recommendations

- Remove the No Parking Any Time signs (R7-1) in front of the school and replace with the existing No Parking directional signs (R8-3)
- Install a new No Parking directional sign (R8-3) midway between the cross-walks
- Remove the non-standard warning signs mounted on the flasher poles
- Trim back or remove as appropriate, the trees in advance of the speed limit and advance school crossing signs on the south end of the segment.
- Remove the post north of the north school crosswalk.
- Install pin down curb and Design "D" Type II delineator at the school parking lot to create a 30' driveway opening; paint curbs yellow.
- Trim the branches in advance of the stop sign on Tie Chute Lane.
- Install a T symbol sign (W2-4) on Tie Chute Lane 500' in advance of the intersection.
- Reset the existing Speed Zone Ahead sign (R2-5) to 750' in advance of the existing Speed Limit sign.

Estimated cost: $810



HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

CONDITION DIAGRAM
SITE 13

Intersection of Tie Chute Lane and Old Hwy. 93

DATE: 10/20/80

PLATE 31 (A)

DIRT

MAILBOXES

PP

PP

DIRT SHOULDER

DIRT

BUSHES

PAVED

24'

CONC. BRIDGE

MATCH 2

FF

PP

N

700FT

STOP

PP

SPEED LIMIT 55

24'

350'

MATCH 2

DIRT

IRR. CULVERT

2375

165C

TRAFFIC VOLUME (ADT)

SPEED ZONE AHEAD

SPEED LIMIT 25

RADAR CONTROL

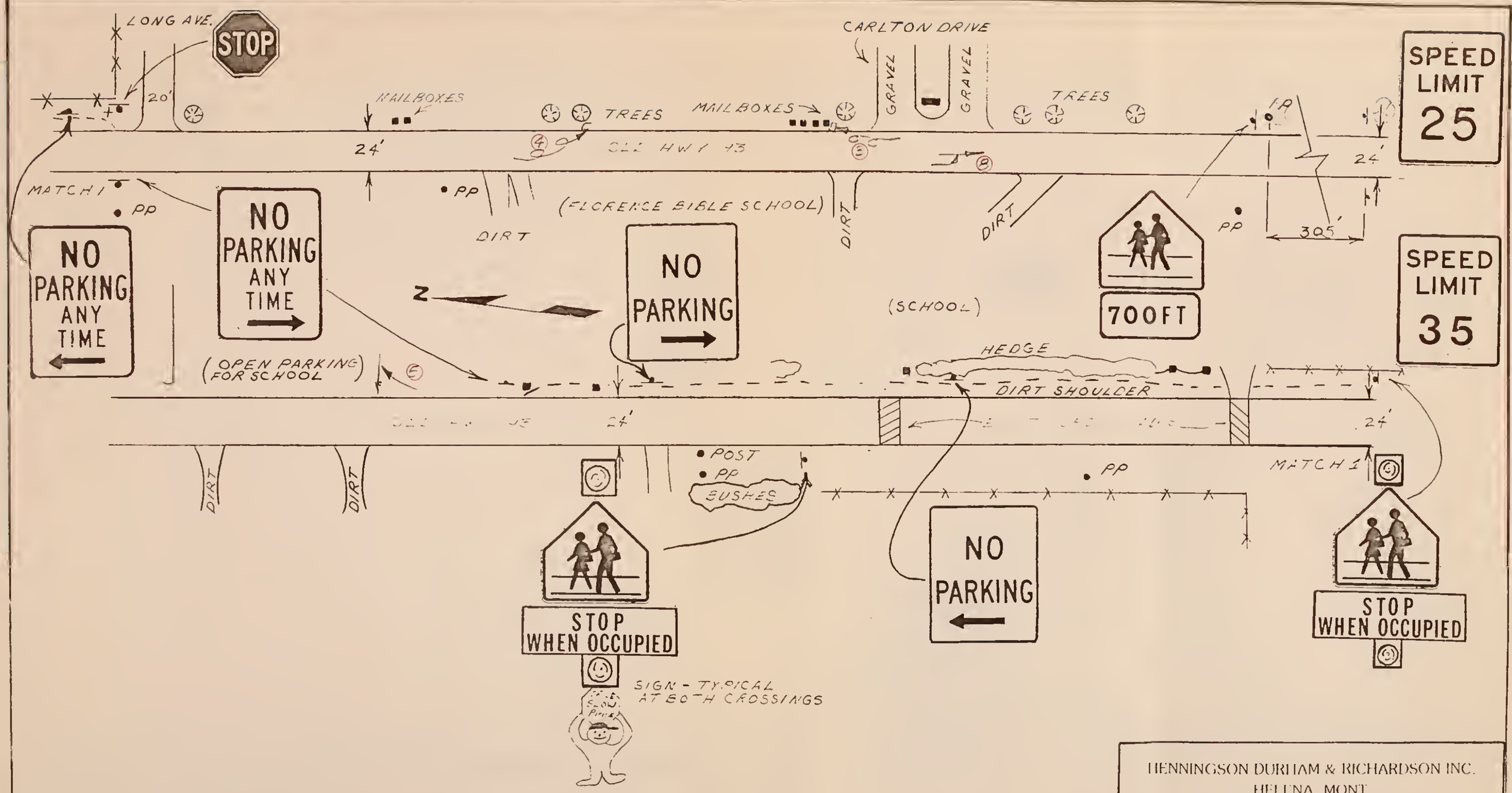
HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

CONDITION DIAGRAM SITE 13

Intersection of Tie Chute Lane and Old Hwy. 93

DATE: 10/20/80

PLATE 31(B)



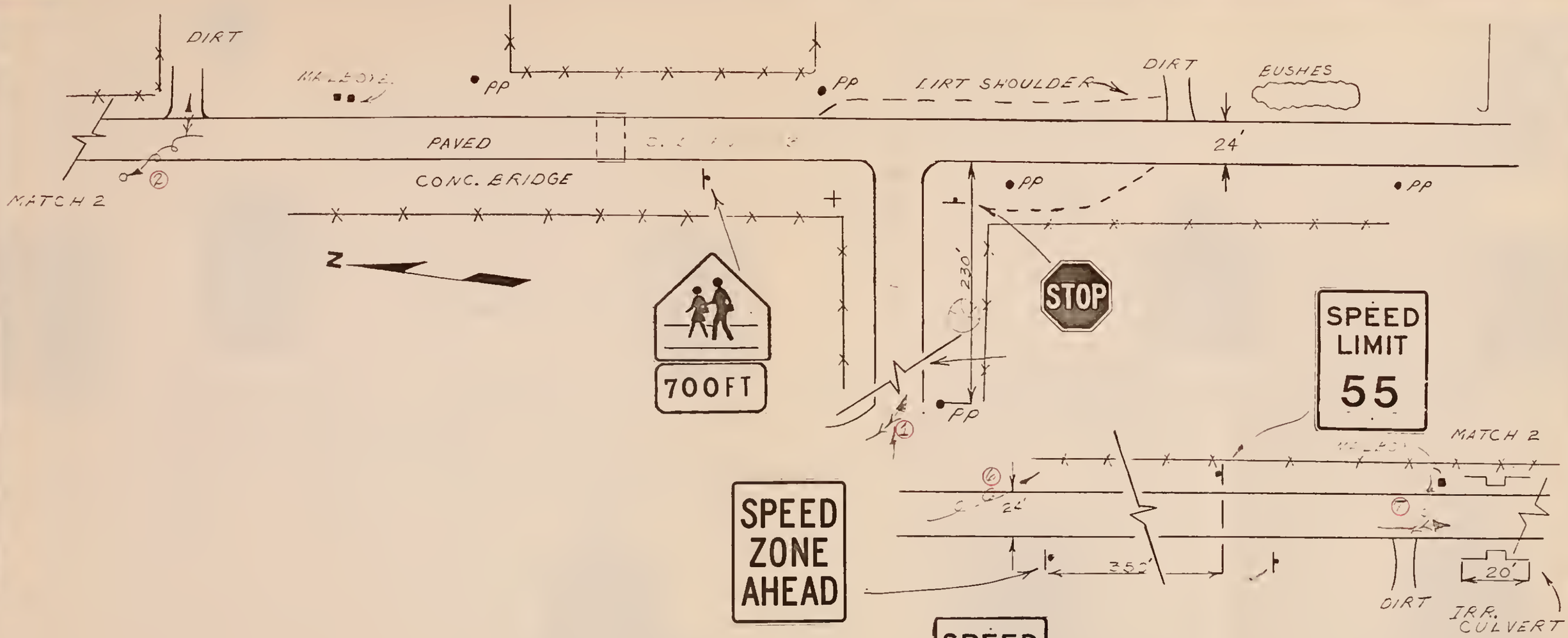
HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

ACCIDENT DIAGRAM
SITE13

Intersection of Tie Chute Lane and Old Hwy. 93

DATE: 10/20/80

PLATE32(A)



ACCIDENTS							
NO.	DAY	DATE	TIME	WEATHER	ROAD CONDITION	DAY / NIGHT	INJ. / P.D.
1	Sat.	7-07-79	09:40	Clear	Dry	Day	P.D.
2	Mon.	7-16-79	13:00	Clear	Dry	Day	1-Inj.
3	Sun.	2-18-79	01:00	Clear	Icy	Night	P.D.
4	Tues.	11-27-79	11:55	Clear	Icy	Day	1-Inj.
5	Weds.	12-12-79	12:15	Clear	Icy	Day	P.D.
6	Mon.	7-02-79	20:34	Clear	Dry	Day	P.D.
7	Weds.	12-12-79	18:45	Clear	Icy	Night	P.D.
8	Fri.	8-31-78	18:40	Clear	Dry	Day	P.D.

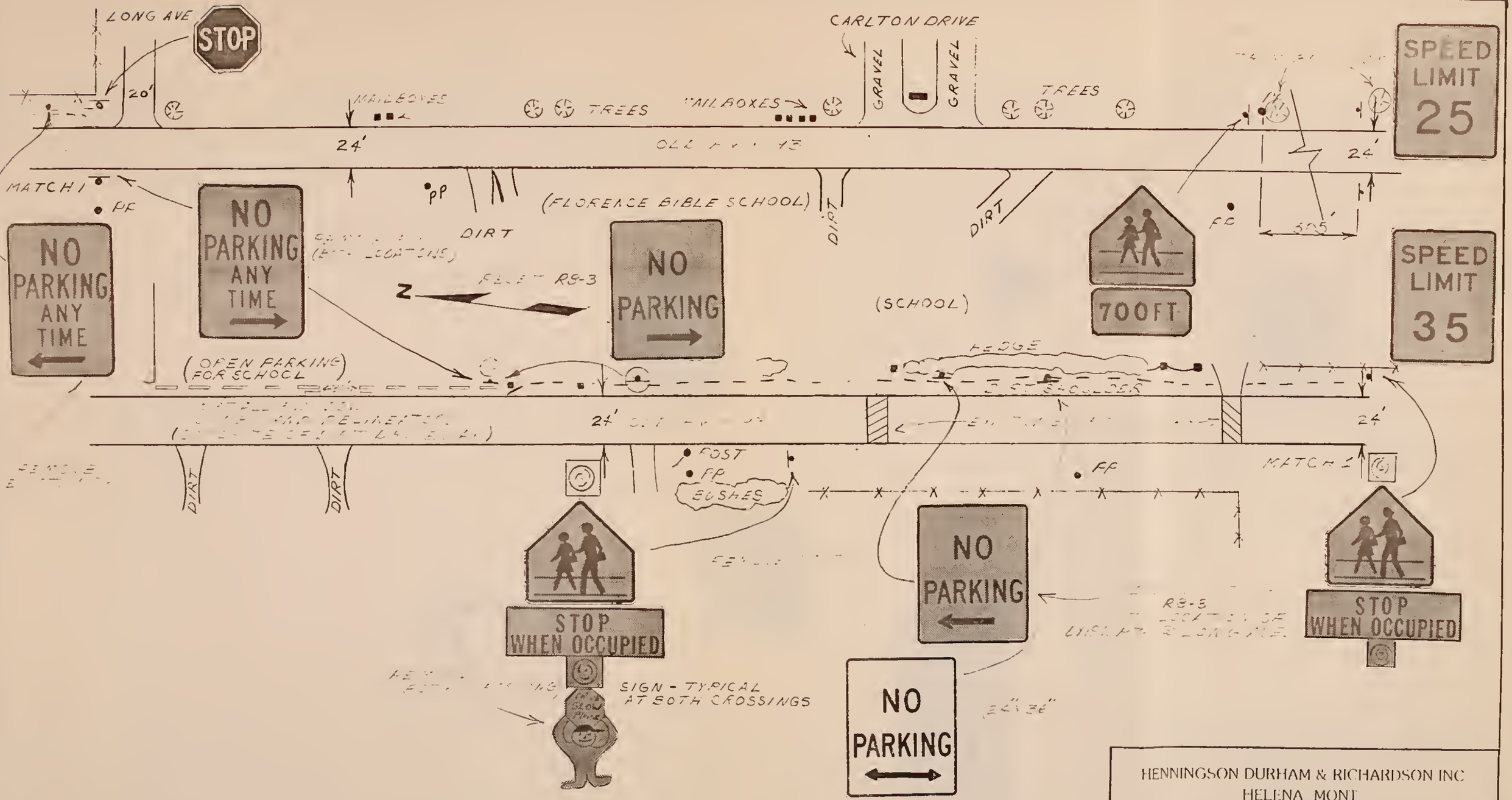
HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

ACCIDENT DIAGRAM
SITE 13

Intersection of Tie Chute Lane and Old Hwy. 93

DATE: 10/20/80

PLATE 32 (B)



HENNINGSON DURHAM & RICHARDSON INC
HELENA, MONT.

IMPROVEMENT DIAGRAM
SITE13

Intersection of Tie Chute Lane and Old Hwy. 93

DATE: 10/20/80

PLATE33(A)

DIRT

MAILBOXES

PP

PP

DIRT SHOULDER

DIRT

BUSHES

PAVED

OLD HWY 93

24'

CONC. BRIDGE

MATCH E

N

700FT

PP

PP

230'

STOP

SPEED LIMIT 55

MATCH E

24'

350'

750'

20'

DIRT

IRR. CULVERT

SPEED ZONE AHEAD

(500' AHEAD OF INTERSECTION)

SPEED LIMIT 25

RADAR CONTROL

R2-5

R2-1 W/PLAQUE

HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

IMPROVEMENT DIAGRAM
SITE 13

Intersection of Tie Chute Lane and Old Hwy. 93

DATE: 10/20/80

PLATE 33 (B)

SITE NO. 14

Location

Site No. 14 is the intersection of West Bridge Road and West Side Road, 1.3 miles west of Hamilton.

Description

All approaches to this intersection are paved. There is advance warning signing on the east and south legs, while the west leg is stop controlled. West Bridge Road is on an uphill 4%± grade from east to west, while West Side Road is level at the intersection and then drops off on a 4.6%± grade approx. 150' south of the intersection. ADT is 1,640 vehicles, and the east and south legs are the major movement.

Accident History

There have been no reported accidents at this site over the 1976-1979 period.

Evaluation

Sight distance on West Side Road is restricted by the crest of the rise immediately south of the intersection. There is a ditch in the southeast corner of the intersection which is located at the edge of the pavement. The turn warning sign on the south approach is partially obscured by tree branches.

Recommendations

- Trim branches in front of the turn warning sign on West Side Road
- Remove the rock at the end of the West Side Road approach
- Relocate the ditch and widen the inside corner of the intersection
- Straighten the roadway on the west leg
- Replace the existing turn warning sign on the south leg with a T symbol sign (W2-4)

A long term recommendation is to improve the vertical alignment of West Side Road by lowering the grade approx. 1' at 150' from the intersection. This will increase the sight distance to the intersection.

Estimated cost of interim improvements: $1,230

Estimated cost of ultimate improvements: $10,600

MAIL BOXES

62'

BOARD FENCE

20'

WEST SIDE RD.

N

STOP

GARAGE

MAIL BOX

STR SIGN

DIRT DR.

PP

FENCE

PP

25'

20'

WEST BRIDGE RD

PP

PP

STR SIGN

PP

136'

ROCK

SIGN

1000

1640

640

TRAFFIC VOLUME
(ADT)

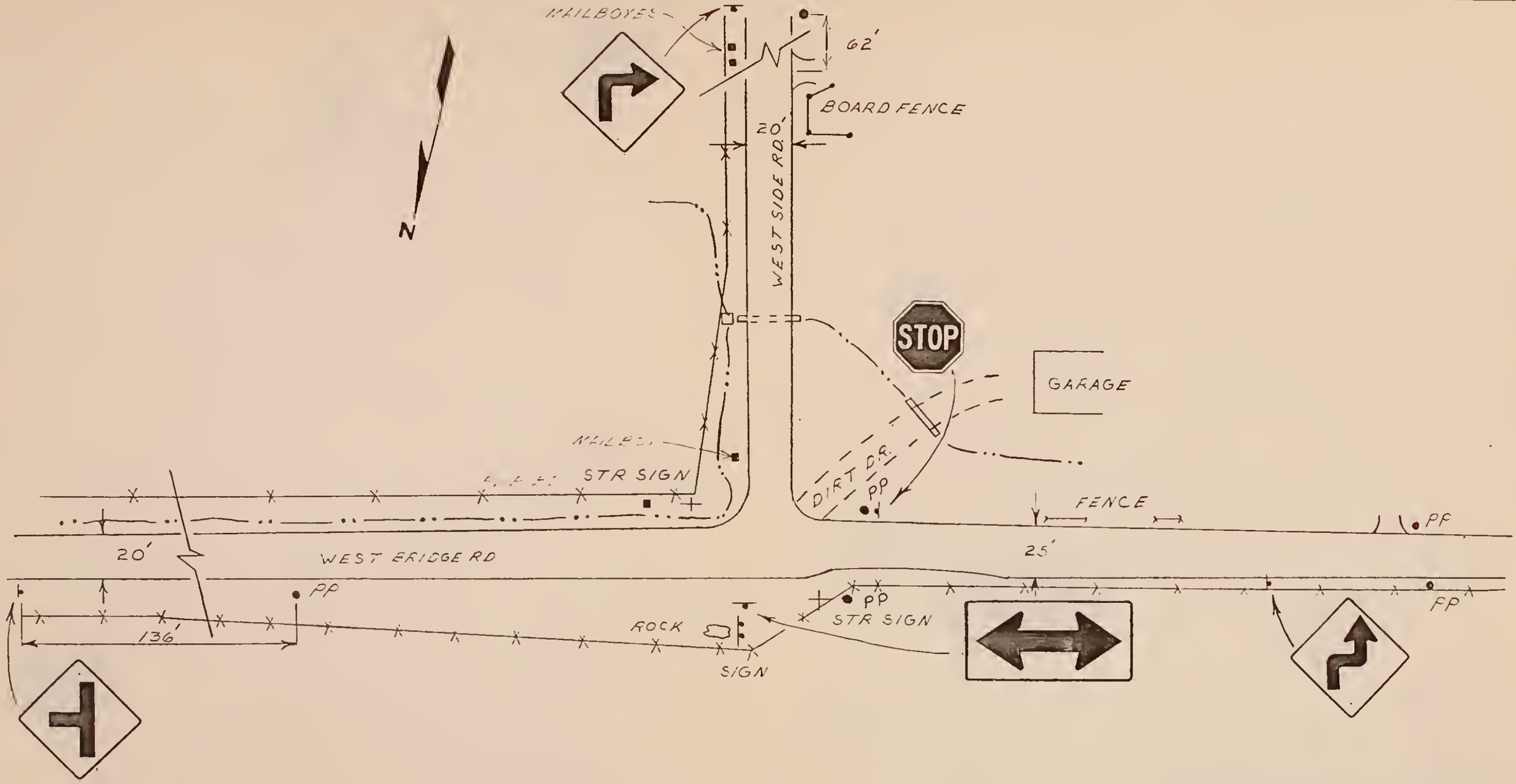
HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

CONDITION DIAGRAM
SITE 14

Intersection of West Side Road &
West Bridge Road

DATE: 10/20/80

PLATE 34



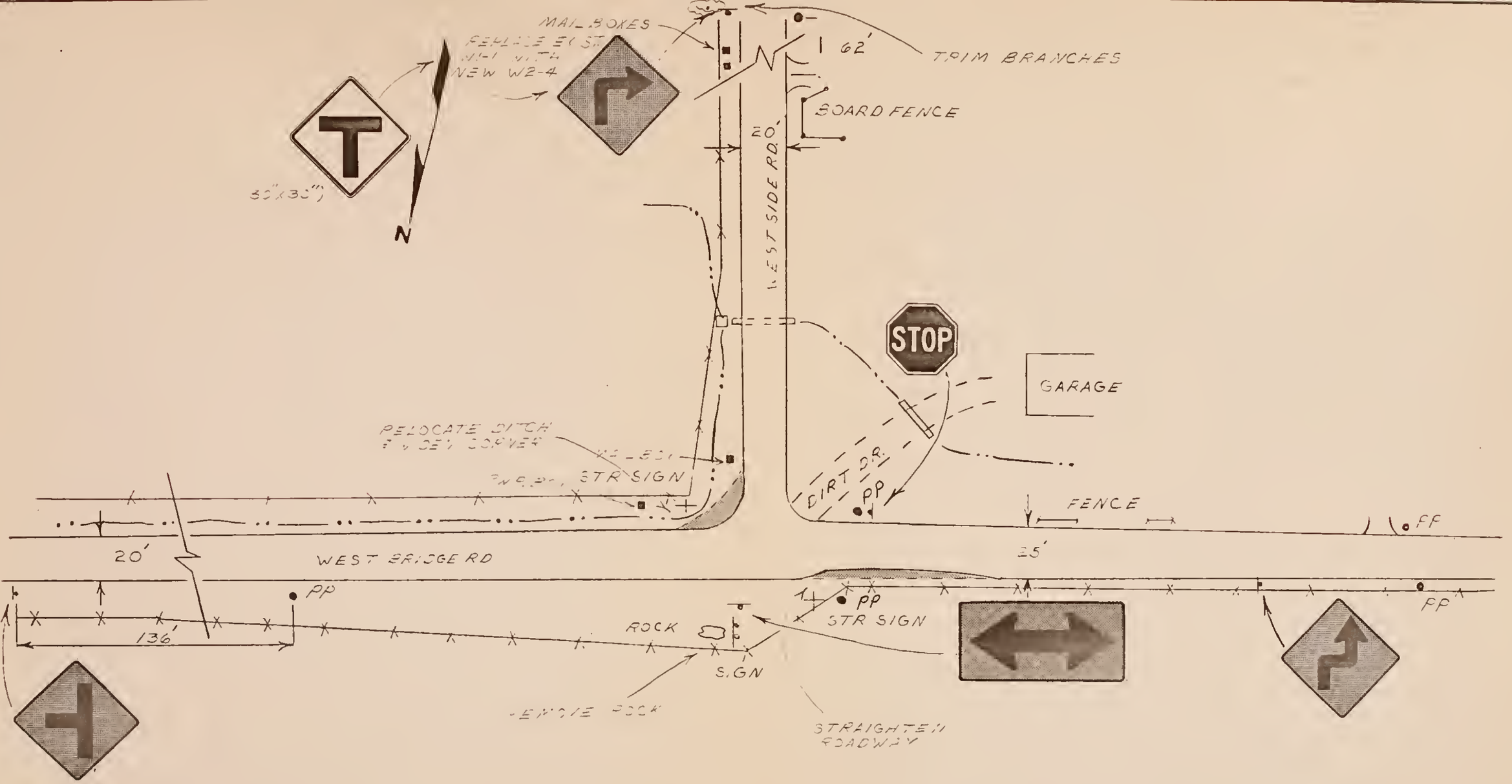
HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

ACCIDENT DIAGRAM
SITE 14

Intersection of West Side Road &
West Bridge Road

DATE: 10/20/80

PLATE 35



NOTE: ULTIMATE IMPROVEMENT IS TO LOWER THE GRADE ON THE SOUTH LEG.

HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

IMPROVEMENT DIAGRAM
SITE 14

Intersection of West Side Road &
West Bridge Road

DATE: 10/20/80

PLATE 36

SITE NO. 15

Location

Site No. 15 is the intersection of Ricketts Road and Blodgett Camp Road one mile north of West Bridge Road.

Description

This site is a modified four legged intersection. Ricketts Road, which forms the east and south legs, is the major movement. Gerer Road to the north is a 20' wide dirt road, and Blodgett Camp Road to the west is a 24' wide dirt road which is at a 67° angle to Gerer Road. The south leg drops away slightly for 150' from the intersection, then rises on a 6%+ grade. Sight distance is restricted around the corner of Ricketts Road, which is signed for 15 mph. Gerer Road and Blodgett Camp Road are yield controlled. ADT is 4,460 vehicles.

Accident History

There has been only one reported accident at this site. It involved a large truck which got too far over on the soft shoulder of Blodgett Camp Road and rolled.

Evaluation

The sharp curve of Ricketts Road is not unexpected when entering the intersection from the east, but is unexpected when approaching from the south. The yield sign of Gerer Road is completely obscured by a large bush 60' in advance of the sign. A bush on the inside of the curve of Ricketts Road restricts sight distance around the curve.

Because of the major traffic movement on Ricketts Road, Ricketts Road must be signed for this movement (refer to the traffic diagram). Gerer Road and Blodgett Camp Road should remain controlled at this site. A variation to standard MUTCD signing is warranted.

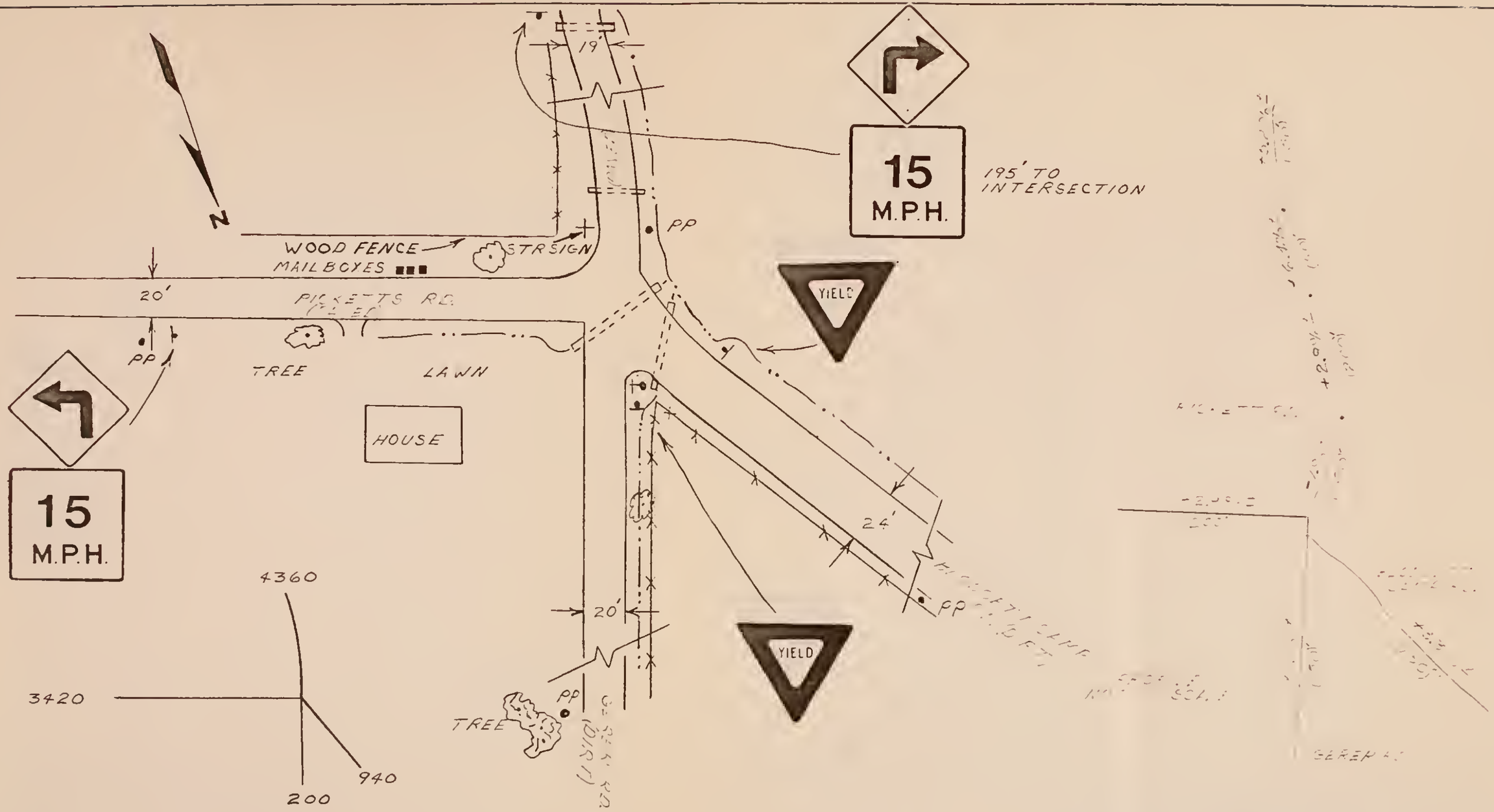
Recommendations

- Reset the existing turn warning sign and advisory speed plate on the south leg to 500' in advance of the intersection.
- Remove the bush on the north leg
- Remove the bush on the inside of the curve of Ricketts Road
- Widen the inside of the curve of Ricketts Road
- Install a single solid centerline around the curve
- Reset the existing yield sign on Blodgett Camp Road to 20' ahead of its present location
- Remove the existing yield sign on Gerer Road and replace with a new Stop sign (R1-1)

A long term recommendation is to straighten the alignment of the south leg of Ricketts Road. The vertical alignment should also be improved by lowering the grade at the crest of the hill.

Estimated cost of interim improvements: $1,100

Estimated cost of ultimate improvements: $32,340



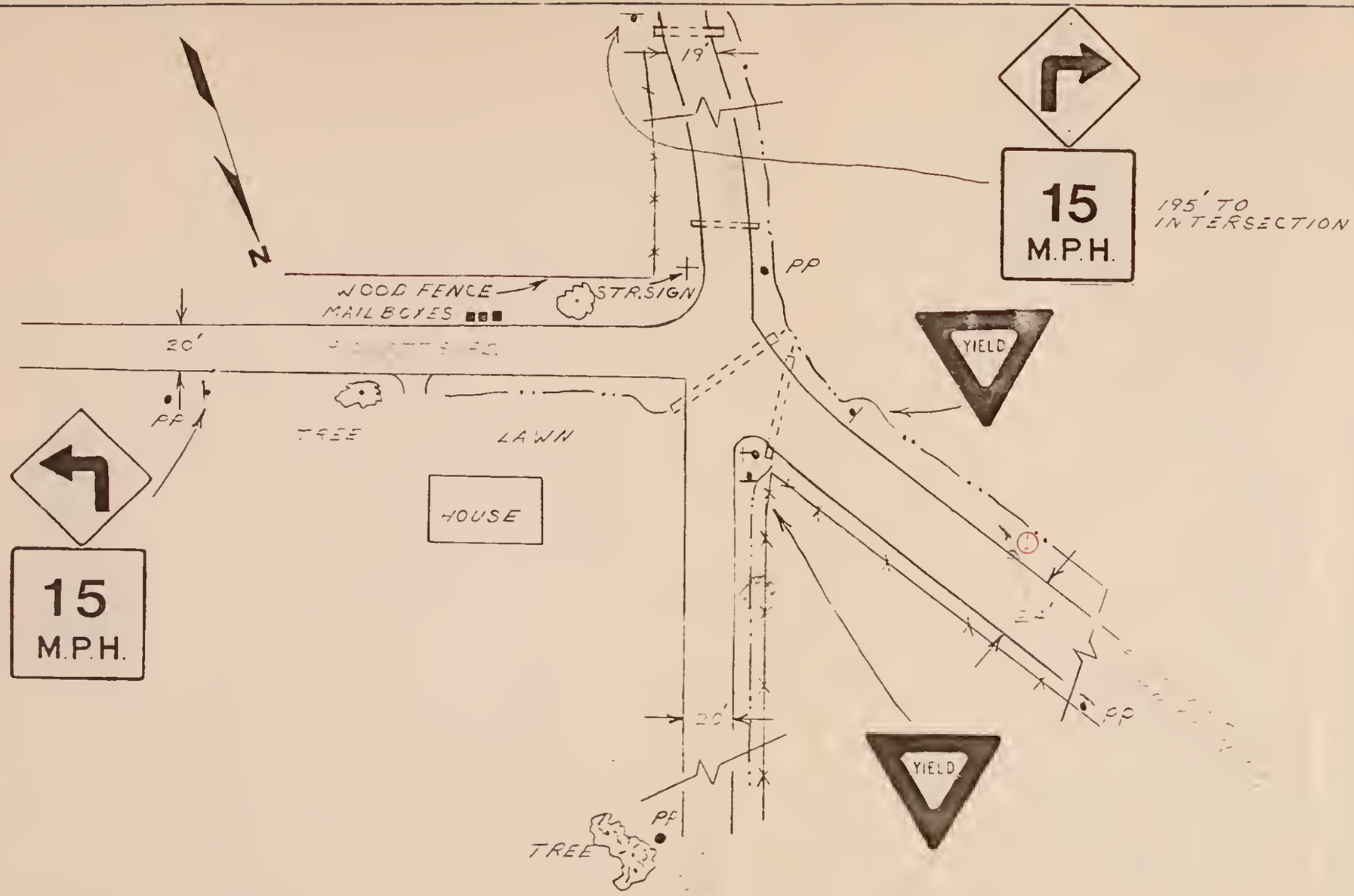
HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

CONDITION DIAGRAM
SITE15

Intersection of Ricketts Road &
Blodgett Camp Road

DATE: 10/20/80

PLATE 37



ACCIDENTS							
NO.	DAY	DATE	TIME	WEATHER	ROAD CONDITION	DAY / NIGHT	INJ. / P.D.
1	Weds.	8-11-76	17:10	Clear	Dry	Day	P.D.

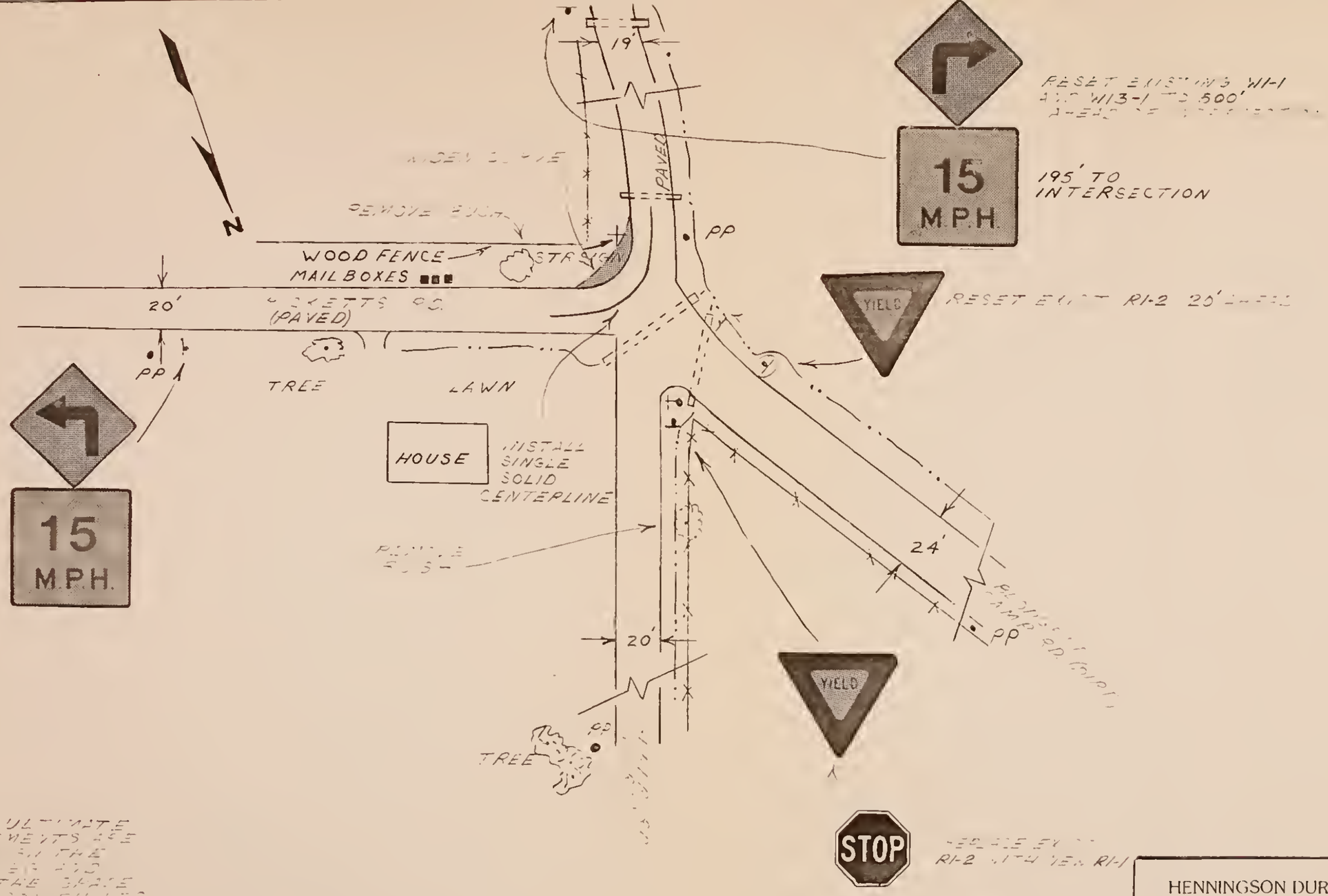
HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

ACCIDENT DIAGRAM
SITE 15

Intersection of Ricketts Road &
Blodgett Camp Road

DATE. 10/20/80

PLATE 38



NOTE: ULTIMATE IMPROVEMENTS ARE SHOWN ON THE PLANS AND ON THE STATE RIGHT OF WAY PLANS

3" = 1'

HENNINGSON DURHAM & RICHARDSON INC.
HELENA, MONT.

IMPROVEMENT DIAGRAM
SITE15

Intersection of Ricketts Road &
Blodgett Camp Road

DATE: 10/20/80

PLATE 39

APPENDIX

INDICATOR VALUES AND HAZARDOUSNESS INDEX (HI)

RANKING

RANK	SITE	NO. ACC.	ACC. RATE	ACC. SEVER.	V/C RATIO	SIGHT DIST.	DRIV. EXP.	INFO. SYS. DEF.	H.I.
1	9	22	100	59	10	84	67	67	62.0
2	1	22	100	64	6	53	50	71	58.2
3	8	22	100	61	6	94	17	67	55.3
4	2	30	100	71	4	91	5	50	54.6
5	11	30	99	62	10	45	17	40	50.3
6	6	17	27	54	19	88	77	88	49.0
7	5	49	22	65	41	86	43	45	46.8
8	4	22	100	65	2	80	0	5	45.2
9	10	26	39	64	18	67	45	45	43.6
10	15	8	6	63	20	69	77	83	42.8
11	13	33	48	50	23	0	12	58	36.2
12	3	49	38	65	24	19	0	27	35.7
13	14	0	0	0	18	20	37	37	12.8

Figures A-1 through A-7 were used to determine the indicator values for each corresponding indicator utilized in this study.

Table A-1 provides the Relative Severity Index (RSI) used for determining the indicator value for the indicator Accident Severity (Figure A-3).

Figure A-8 presents the Driver Expectancy Problems Rating Form, which describes the evaluation procedures for the subjective indicator, Driver Expectancy (Figure A-6).

Figure A-9 presents the Information System Deficiencies Rating Form, which describes the evaluation procedures for the subjective indicator, Information System Deficiencies (Figure A-7).

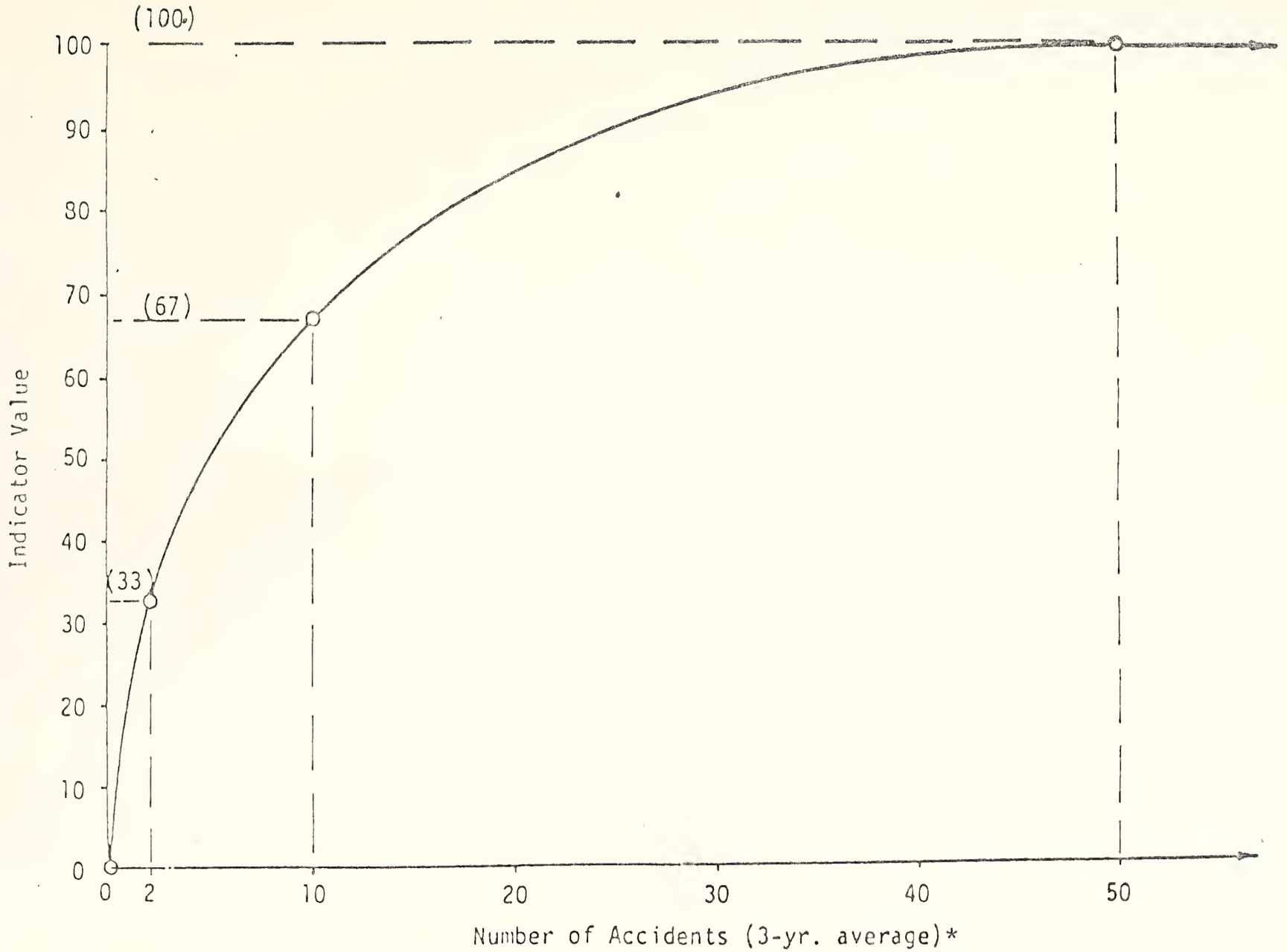


Figure A-1 Indicator values for number of accidents.

* For this study, the 4-yr. average was used.

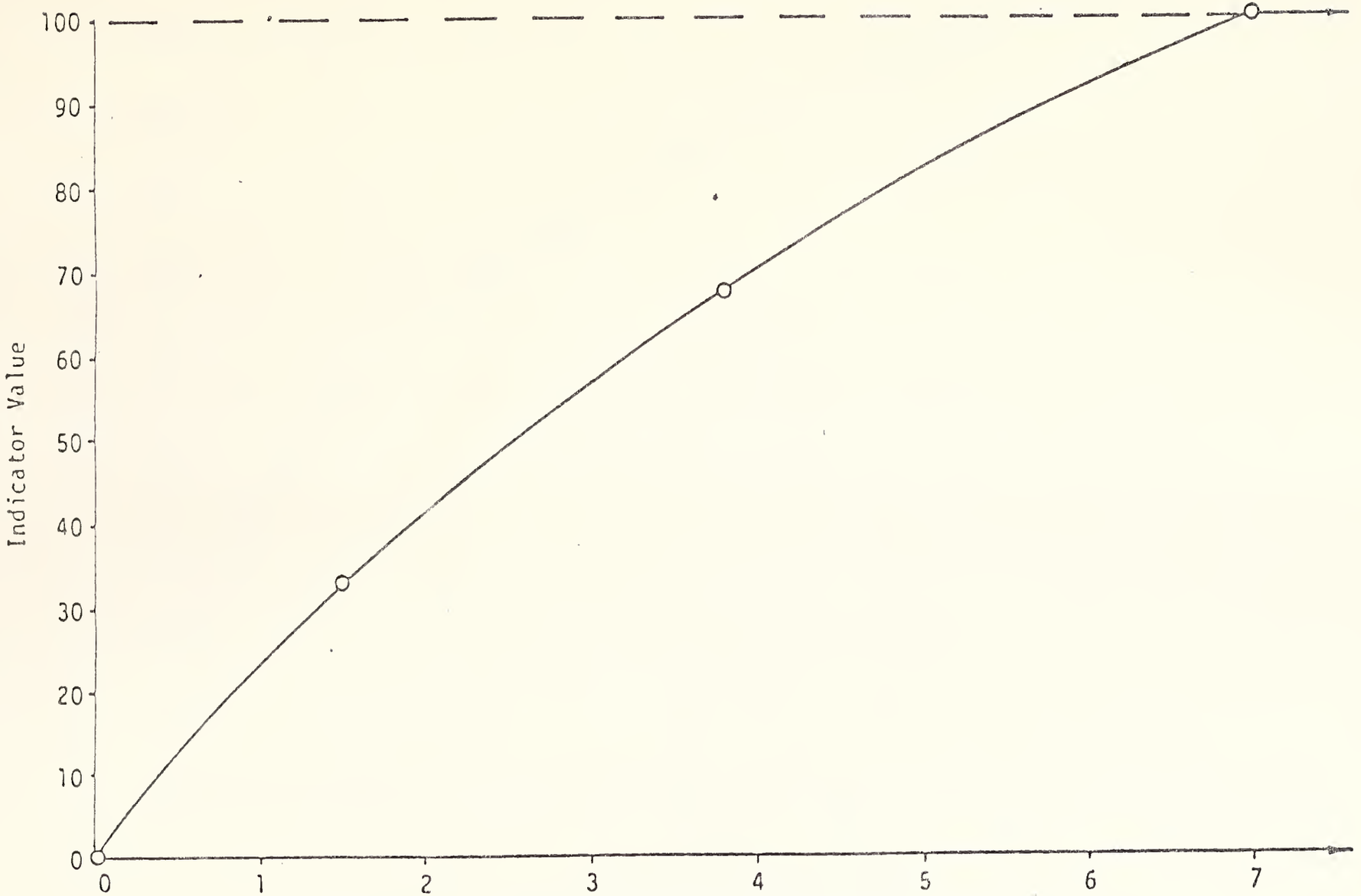


Figure A-2 Indicator values for accident rate.

* For this study, the 4-yr. average was used

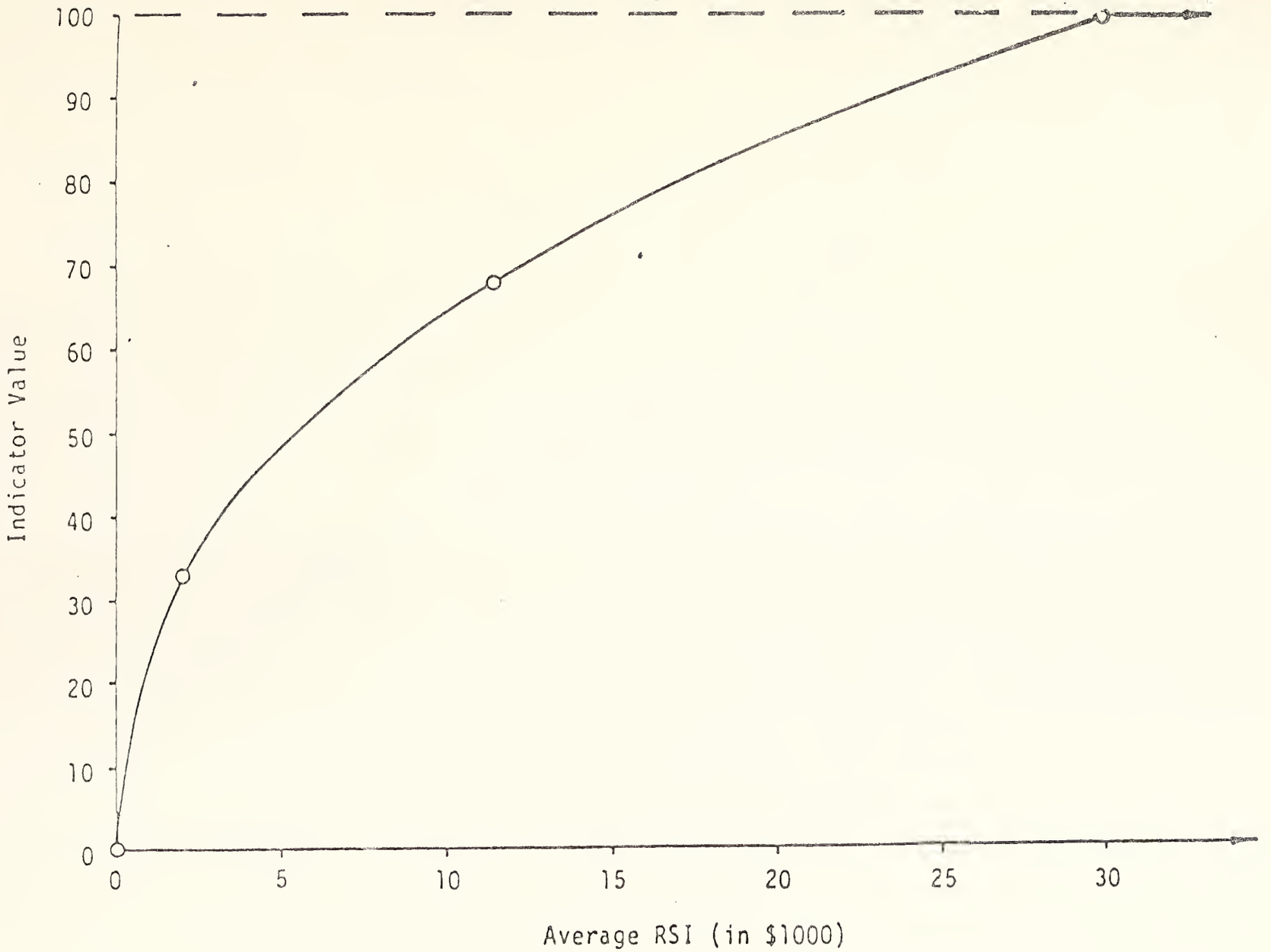


Figure A-3 Indicator value for accident severity.

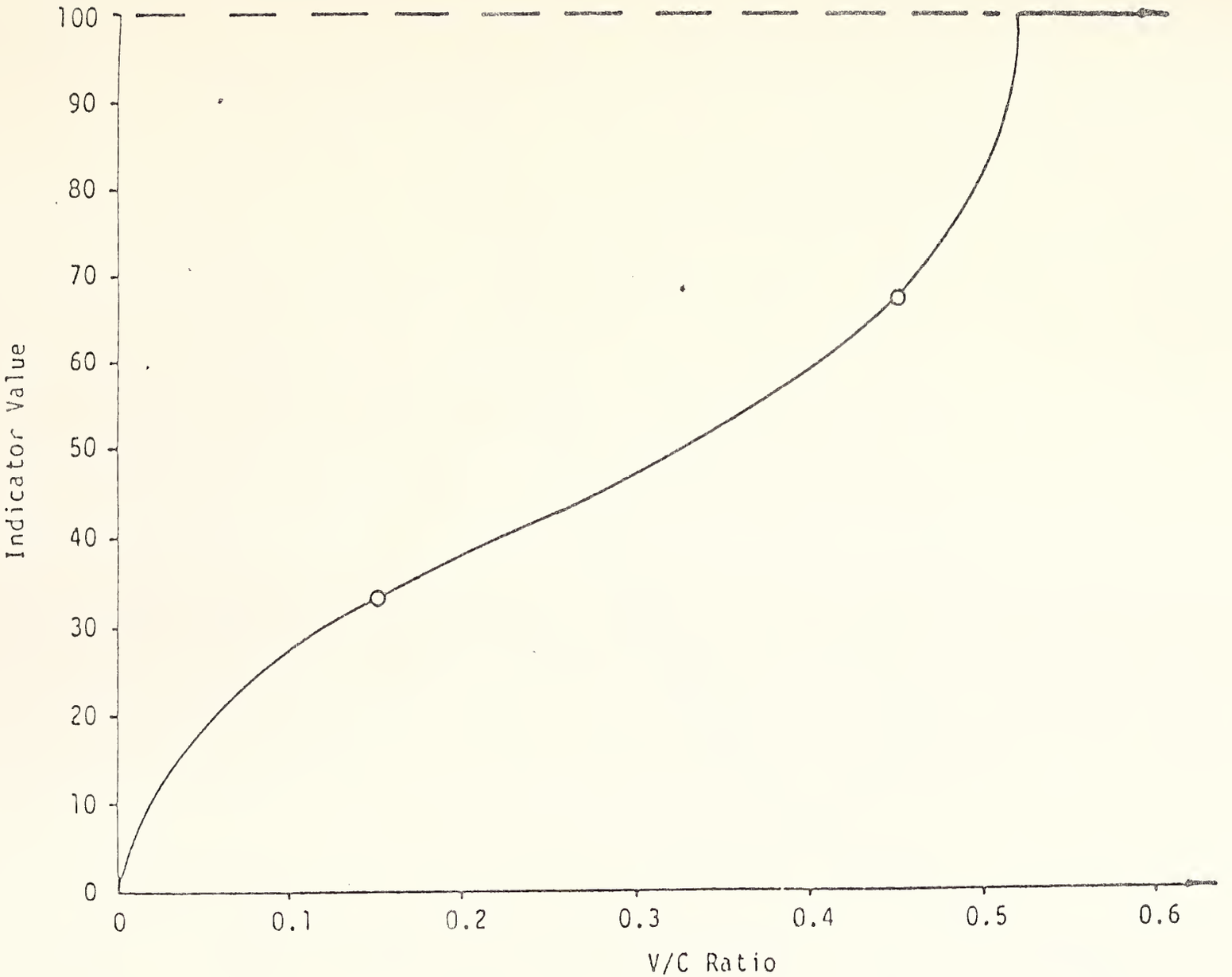


Figure A-4 Indicator values for V/C ratio.

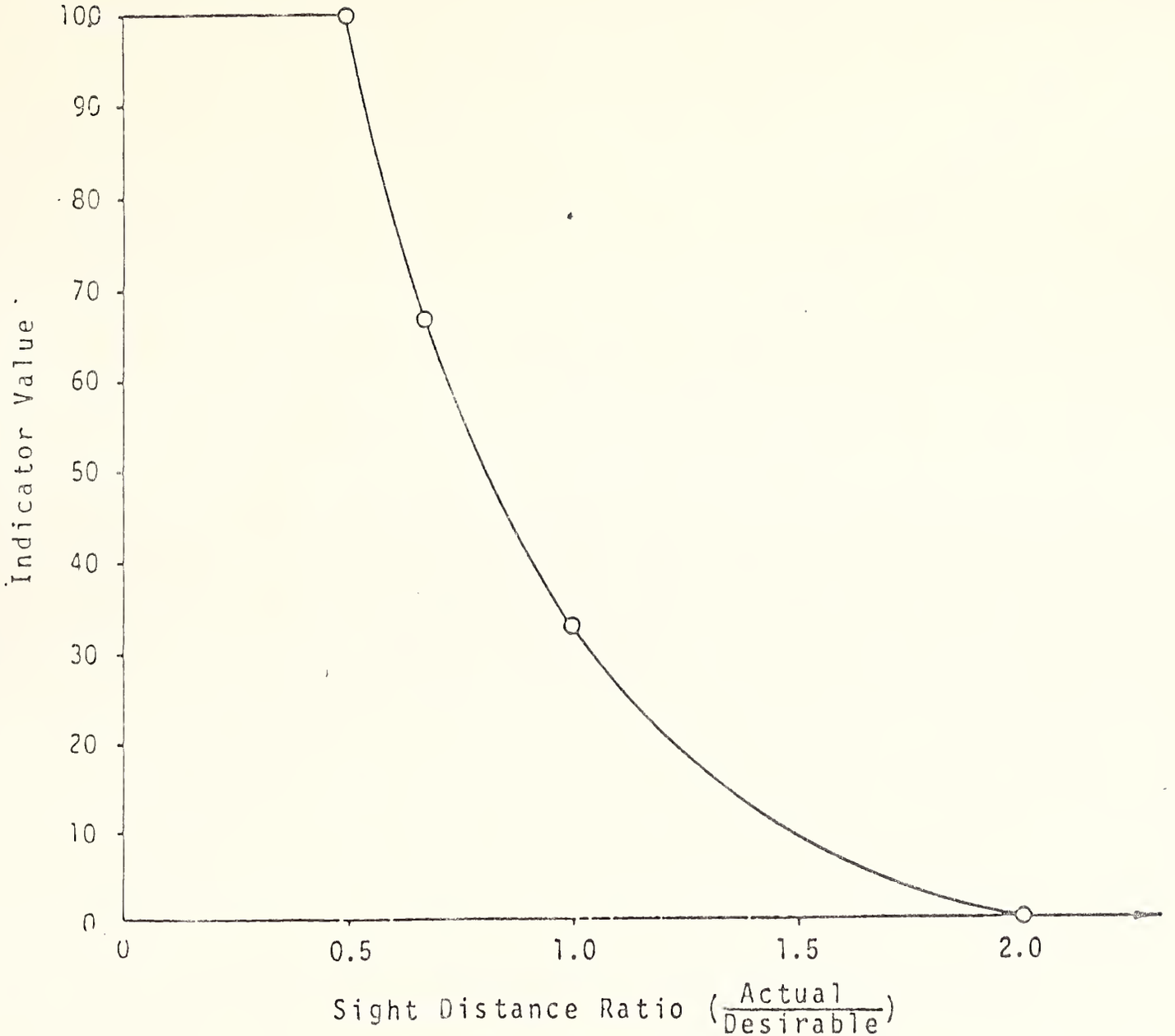


Figure A-5 Indicator values for sight distance.

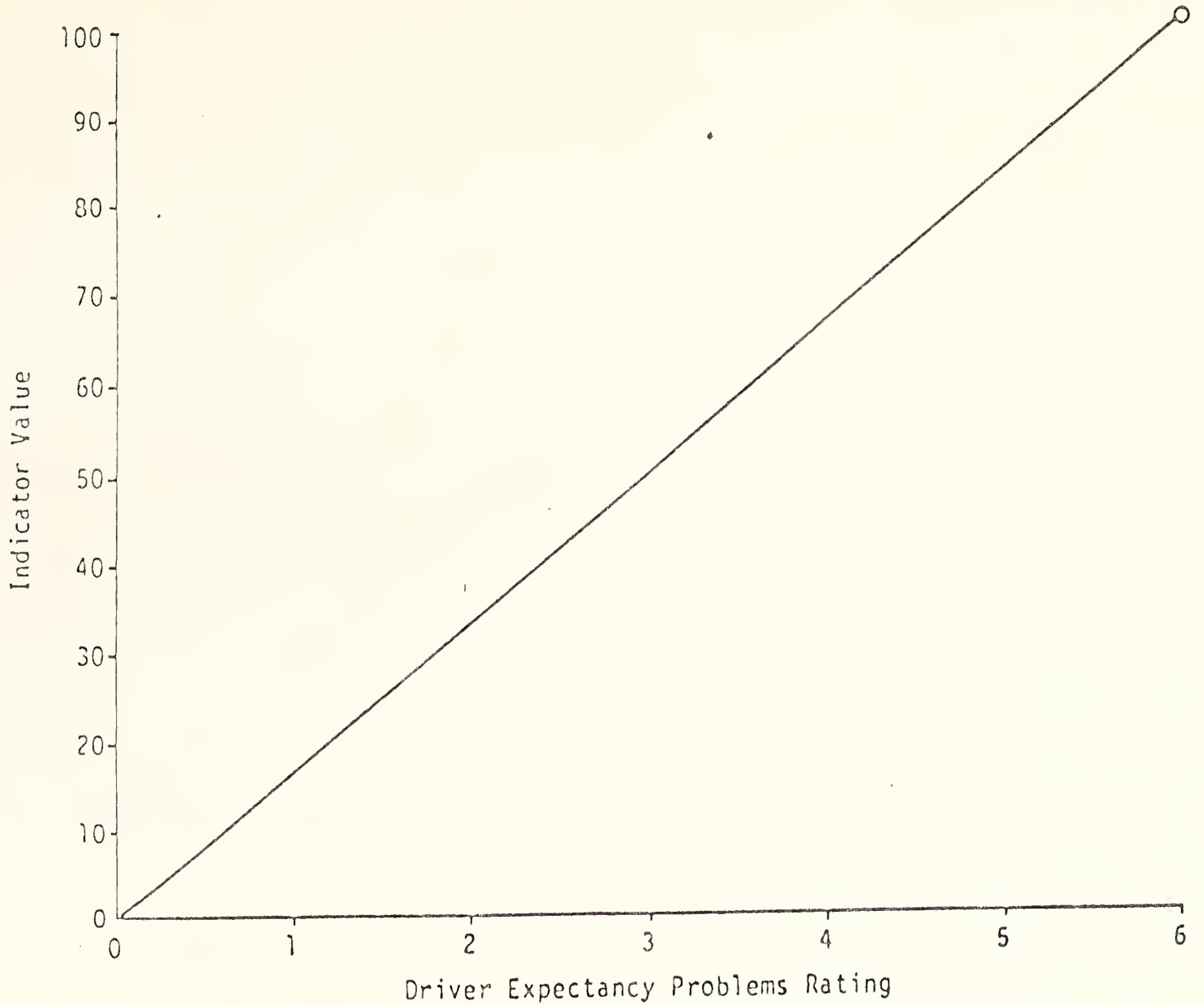


Figure A-6 Indicator values for driver expectancy.

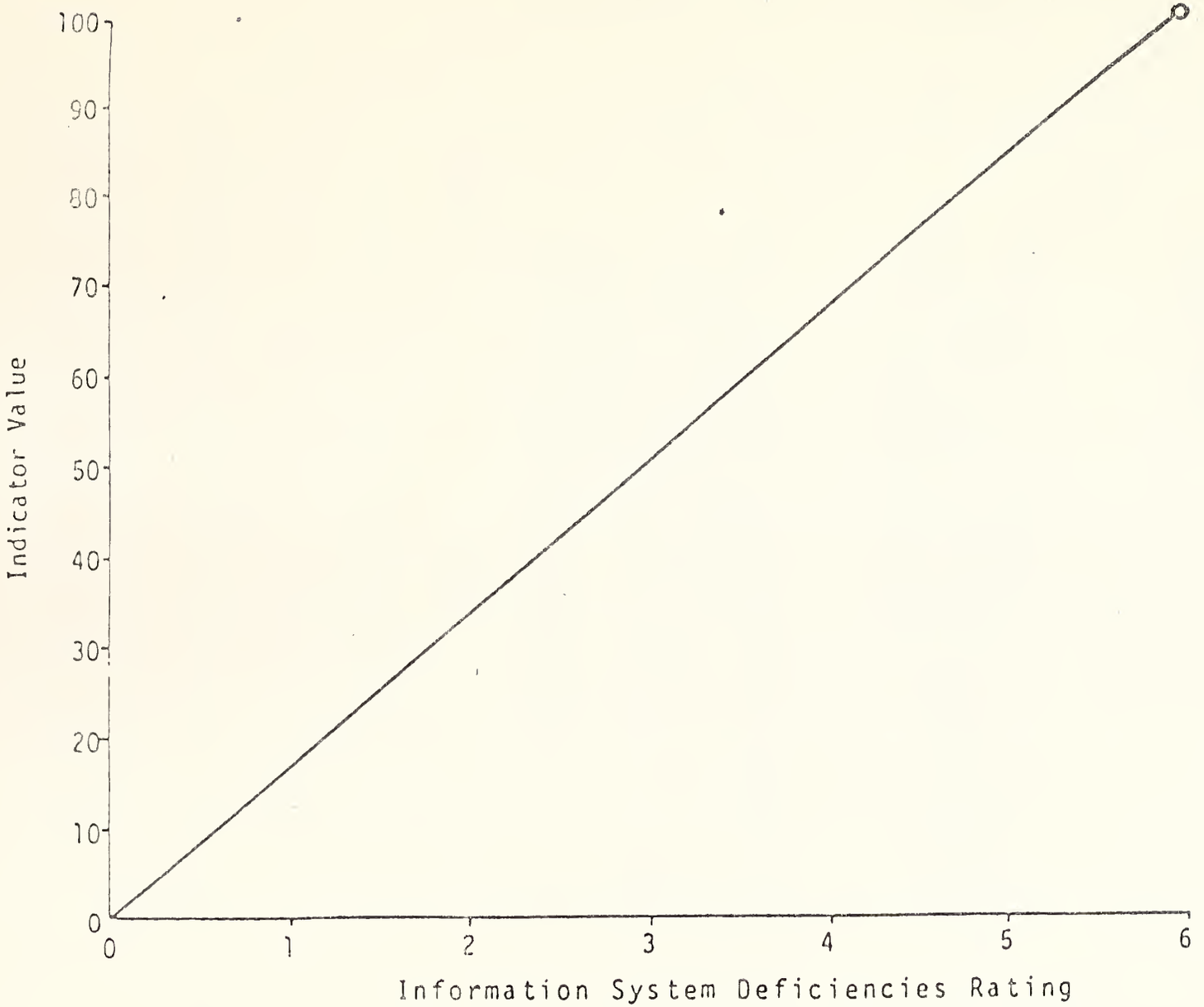


Figure A-7 Indicator values for information system deficiencies.

DRIVER EXPECTANCY PROBLEMS RATING FORM

Ratings:

0 -- Nothing unexpected or unusual at this location.

Actions required (if any) entirely consistent with driving strategy on approach.

Standard geometry, with pathway(s) for intended movement(s) clearly evident.

No interferences by other traffic likely.

1 --

2 --

3 -- Situation somewhat unexpected.

Driver must be alert, but should be able to respond adequately at "last minute" to most combinations of adverse circumstances.

Some initial confusion on intended path(s) or movement(s).

Interference from other traffic may create some degree of confusion or uncertainty for average driver.

4 --

5 --

6 -- Very unusual situation; will "surprise" many unfamiliar drivers.

Driver required to make major change in driving tactics from those employed over past few miles.

At least a "near accident" almost expected if driver is even moderately inattentive; evasive actions likely to be required.

Intended pathway(s) confusing under fairly normal traffic or lighting conditions.

Other traffic, or lack of it, aggravates situation and misleads driver or deprives him of important cues.

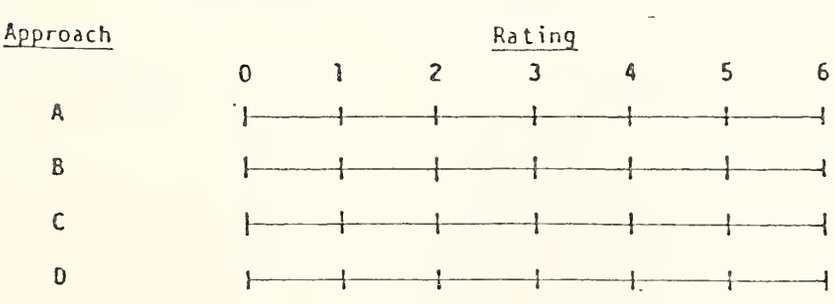


Figure A-8 Driver expectancy problems rating form.

INFORMATION SYSTEM DEFICIENCIES RATING FORM

Ratings:

0 -- Information for required decisions complete and unambiguous.
Signs, markings, delineation in good repair, clean, highly visible.
"Positive guidance" leads driver to appropriate path; makes "error" difficult.
Approach speeds of most drivers are appropriate.
Light decision load; easy and obvious.

1 --

2 --

3 -- Some information lacking or somewhat misleading.
Signs should be moved or augmented for better visibility or to provide more decision time.
Visibility of signs, markings, and delineation barely adequate.
Advisory speed information should be changed slightly, or added.
Medium decision load; average driver will be able to handle situation, but may be a little uncomfortable.

4 --

5 --

6 -- Important information missing.
Complete new "information system" needed -- design and installation.
Present signs and markings in very poor condition; need replacement.
Speed limit and/or advisory speed needed; either missing or totally inappropriate at present.
"Positive guidance" on appropriate path lacking; a clutter of negative delineation only.
Heavy decision load; complete attention of average driver required; a "tense" situation at best.

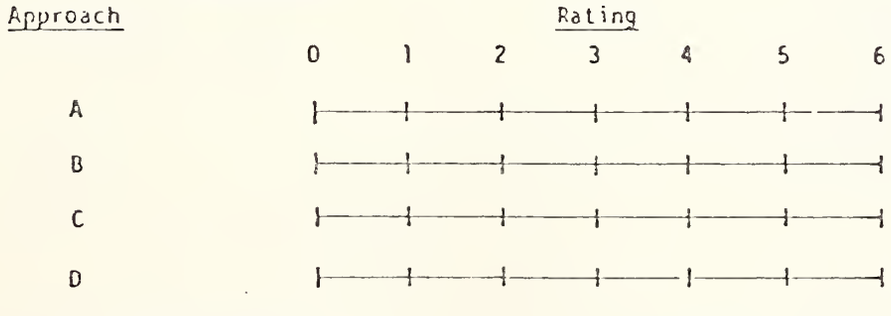


Figure A-9 Information system deficiencies rating form.

Table A-1 Relative severity index.

Type of Accident	RSI	
Multi-Vehicle, At Intersection	**Urban**	**Rural**
Entering at angle	$ 4,300	$14,400
From same direction -- both going straight	2,800	5,100
From same direction -- one turn, one straight	2,500	5,100
From same direction -- one stopped	3,800	5,200
From same direction -- all others	2,000	6,300
From opposite direction -- both going straight	4,000	20,000
From opposite direction -- one left turn, one straight	4,400	15,400
From opposite direction -- all others	2,700	3,800
Not stated	3,800	5,200
Multi-Vehicle, Non-Intersection		
Going opposite direction -- both moving	$ 4,400	$19,600
Going same direction -- both moving	2,900	8,100
One car parked	1,600	2,400
One car stopped in traffic	4,200	6,800
One car entering parked position	1,900	2,300
One car leaving parked position	1,200	2,700
One car entering alley or driveway	3,400	6,000
One car leaving alley or driveway	2,000	4,400
All others	1,700	7,600
Not stated	3,400	6,000
Motor Vehicle with Pedestrian, At Intersection and Non-Intersection		
Vehicle going straight	$20,000	$49,000
Vehicle turning right	13,600	11,200
Vehicle turning left	17,100	11,200
Vehicle backing	20,600	11,200
All others	14,500	11,200
Not stated	11,200	11,200
Single Vehicle, at Intersection		
Collision with train	$26,700	$39,100
Collision with bicycle	13,100	31,900
Injury in vehicle, jacknifed	5,200	2,000
Collision with fixed object in road	5,500	7,000
Overturned in road	9,200	7,500
Left road	5,200	12,300

Table A-1 Relative severity index (continued).

Type of Accident	RSI	
Single Vehicle, Non-Intersection	Urban	Rural
Collision with train	$26,700	$39,100
Collision with bicycle	13,100	31,900
Injury in vehicle, jacknifed	5,200	2,000
Collision with fixed object in road	6,300	9,200
Overturned in road	10,000	9,400
Left road at curve	7,600	12,400
Left road on straight road	5,200	10,500
Other One Motor Vehicle, At Intersection and Non-Intersection		
Fell from moving vehicle	$15,000	$57,200
Collision with animal	4,800	1,800
Collision with other object	4,700	4,400
All others	5,200	2,000
Not stated	3,200	3,400

DETERMINATION OF HAZARDOUSNESS INDEX

Site Number 1 Date

Type

Indicator	Date Value	Indicator Value		Weight		Partial H.I.'s
Number of Accidents	1.0 acc/yr	22	x	0.145	=	3.2
Accident Rate	9.4 acc/MEV	100	x	0.199	=	19.9
Accident Severity	10,975 dollars	64	x	0.169	=	10.8
Volume/Capacity Ratio	0.009	6	x	0.073	=	0.4
Sight Distance Ratio	(wt.avg.)	53	x	0.066	=	3.5
Traffic Conflict	conf/hr.)	–	x	0.053	=	–
Erratic Maneuvers	e.m./hr.	–	x	0.061	=	–
Driver Expectancy	3 (wt.avg.)	50	x	0.132	=	6.6
Info. System Deficiencies	4.3 (wt.avg.)	71	x	0.102	=	7.2
Sums:				.886 *		51.6

$$H.I. = \frac{\text{Sum of Partial H.I.'s}}{\text{Sum of Applicable Weights}} = \frac{51.6}{.886} = 58.2$$

Relative Strength of Evaluation:

$$\frac{\text{Sum of Applicable Weights}}{100} = 89\ \%$$

*Do not include weights for indicators not used at this site.

DETERMINATION OF HAZARDOUSNESS INDEX

Site Number 2 Date _____

Type _____

Indicator	Date Value	Indicator Value		Weight		Partial H.I.'s
Number of Accidents	1.8 acc/yr	30	x	0.145	=	4.4
Accident Rate	35.7 acc/MEV	100	x	0.199	=	19.9
Accident Severity	14,410 dollars	71	x	0.169	=	12.0
Volume/Capacity Ratio	0.006	4	x	0.073	=	0.3
Sight Distance Ratio	_____(wt.avg.)	91	x	0.066	=	6.0
Traffic Conflict	_____conf/hr.)	–	x	0.053	=	–
Erratic Maneuvers	_____e.m./hr.	–	x	0.061	=	–
Driver Expectancy	0.3 (wt.avg.)	5	x	0.132	=	0.7
Info. System Deficiencies	3 (wt.avg.)	50	x	0.102	=	5.1
Sums:				.886 *		48.4

$$\text{H.I.} = \frac{\text{Sum of Partial H.I.'s}}{\text{Sum of Applicable Weights}} = \frac{48.4}{.886} = 54.6$$

Relative Strength of Evaluation:

$$\frac{\text{Sum of Applicable Weights}}{100} = 89\ \%$$

*Do not include weights for indicators not used at this site.

DETERMINATION OF HAZARDOUSNESS INDEX

Site Number 3 Date _____

Type _____

Indicator	Date Value	Indicator Value		Weight		Partial H.I.'s
Number of Accidents	2.5 acc/yr	49	x	0.145	=	7.1
Accident Rate	1.8 acc/MEV	38	x	0.199	=	7.6
Accident Severity	11,580 dollars	65	x	0.169	=	11.0
Volume/Capacity Ratio	0.083	24	x	0.073	=	1.8
Sight Distance Ratio	_____ (wt.avg.)	19	x	0.066	=	1.3
Traffic Conflict	– conf/hr.)	–	x	0.053	=	–
Erratic Maneuvers	– e.m./hr.	–	x	0.061	=	–
Driver Expectancy	0 (wt.avg.)	0	x	0.132	=	0
Info. System Deficiencies	1.6 (wt.avg.)	27	x	0.102	=	2.8
Sums:				.886*		31.6

$$\text{H.I.} = \frac{\text{Sum of Partial H.I.'s}}{\text{Sum of Applicable Weights}} = \frac{31.6}{.886} = 35.7$$

Relative Strength of Evaluation:

$$\frac{\text{Sum of Applicable Weights}}{100} = 89\ \%$$

*Do not include weights for indicators not used at this site.

DETERMINATION OF HAZARDOUSNESS INDEX

Site Number 4 Date

Type

Indicator	Date Value	Indicator Value		Weight		Partial H.I.'s
Number of Accidents	1.0 acc/yr	22	x	0.145	=	3.2
Accident Rate	35.7 acc/MEV	100	x	0.199	=	19.9
Accident Severity	11,450 dollars	65	x	0.169	=	11.0
Volume/Capacity Ratio	0.002	2	x	0.073	=	0.1
Sight Distance Ratio	(wt.avg.)	80	x	0.066	=	5.3
Traffic Conflict	conf/hr.)	-	x	0.053	=	-
Erratic Maneuvers	e.m./hr.	-	x	0.061	=	-
Driver Expectancy	0 (wt.avg.)	0	x	0.132	=	0
Info. System Deficiencies	0.3 (wt.avg.)	5	x	0.102	=	0.5
Sums:				.886 *		40.0

$$\text{H.I.} = \frac{\text{Sum of Partial H.I.'s}}{\text{Sum of Applicable Weights}} = \frac{40.0}{.886} = 45.2$$

Relative Strength of Evaluation:

$$\frac{\text{Sum of Applicable Weights}}{100} = 89\ \%$$

*Do not include weights for indicators not used at this site.

DETERMINATION OF HAZARDOUSNESS INDEX

Site Number 5 Date

Type

Indicator	Date Value	Indicator Value		Weight		Partial H.I.'s
Number of Accidents	2.5 acc/yr	49	x	0.145	=	7.1
Accident Rate	0.9 acc/MEV	22	x	0.199	=	4.4
Accident Severity	11,520 dollars	65	x	0.169	=	11.0
Volume/Capacity Ratio	0.24	41	x	0.073	=	3.0
Sight Distance Ratio	(wt.avg.)	86	x	0.066	=	5.7
Traffic Conflict	conf/hr.)	-	x	0.053	=	-
Erratic Maneuvers	e.m./hr.	-	x	0.061	=	-
Driver Expectancy	2.6 (wt.avg.)	43	x	0.132	=	5.7
Info. System Deficiencies	2.7 (wt.avg.)	45	x	0.102	=	4.6
Sums:				.886*		41.5

$$\text{H.I.} = \frac{\text{Sum of Partial H.I.'s}}{\text{Sum of Applicable Weights}} = \frac{41.5}{.886} = 46.8$$

Relative Strength of Evaluation:

$$\frac{\text{Sum of Applicable Weights}}{100} = 89\ \%$$

*Do not include weights for indicators not used at this site.

DETERMINATION OF HAZARDOUSNESS INDEX

Site Number 6 Date

Type

Indicator	Date Value	Indicator Value		Weight		Partial H.I.'s
Number of Accidents	0.8 acc/yr	17	x	0.145	=	2.5
Accident Rate	1.2 acc/MEV	27	x	0.199	=	5.4
Accident Severity	7,200 dollars	54	x	0.169	=	9.1
Volume/Capacity Ratio	0.052	19	x	0.073	=	1.4
Sight Distance Ratio	(wt.avg.)	88	x	0.066	=	5.8
Traffic Conflict	conf/hr.)	—	x	0.053	=	—
Erratic Maneuvers	e.m./hr.	—	x	0.061	=	—
Driver Expectancy	4.7 (wt.avg.)	77	x	0.132	=	10.2
Info. System Deficiencies	5.3 (wt.avg.)	88	x	0.102	=	9.0
Sums:				.886*		43.4

$$\text{H.I.} = \frac{\text{Sum of Partial H.I.'s}}{\text{Sum of Applicable Weights}} = \frac{43.4}{.886} = 49.0$$

Relative Strength of Evaluation:

$$\frac{\text{Sum of Applicable Weights}}{100} = 89\ \%$$

*Do not include weights for indicators not used at this site.

DETERMINATION OF HAZARDOUSNESS INDEX

Site Number 8 Date

Type

Indicator	Date Value	Indicator Value		Weight		Partial H.I.'s
Number of Accidents	1.0 acc/yr	22	x	0.145	=	3.2
Accident Rate	8.85 acc/MEV	100	x	0.199	=	19.9
Accident Severity	9,850 dollars	61	x	0.169	=	10.3
Volume/Capacity Ratio	0.009	6	x	0.073	=	0.4
Sight Distance Ratio	(wt.avg.)	94	x	0.066	=	6.2
Traffic Conflict	conf/hr.)	-	x	0.053	=	-
Erratic Maneuvers	e.m./hr.	-	x	0.061	=	-
Driver Expectancy	1 (wt.avg.)	17	x	0.132	=	2.2
Info. System Deficiencies	4 (wt.avg.)	67	x	0.102	=	6.8
Sums:				.886 *		49.0

$$\text{H.I.} = \frac{\text{Sum of Partial H.I.'s}}{\text{Sum of Applicable Weights}} = \frac{49.0}{.886} = 55.3$$

Relative Strength of Evaluation:

$$\frac{\text{Sum of Applicable Weights}}{100} = 89\ \%$$

*Do not include weights for indicators not used at this site.

DETERMINATION OF HAZARDOUSNESS INDEX

Site Number 9 Date _____

Type _____

Indicator	Date Value	Indicator Value		Weight		Partial H.I.'s
Number of Accidents	1.0 acc/yr	22	x	0.145	=	3.2
Accident Rate	10.3 acc/MEV	100	x	0.199	=	19.9
Accident Severity	9,000 dollars	59	x	0.169	=	10.0
Volume/Capacity Ratio	0.018	10	x	0.073	=	0.7
Sight Distance Ratio	_____(wt.avg.)	84	x	0.066	=	5.5
Traffic Conflict	_____conf/hr.)	-	x	0.053	=	-
Erratic Maneuvers	_____e.m./hr.	-	x	0.061	=	-
Driver Expectancy	4 (wt.avg.)	67	x	0.132	=	8.8
Info. System Deficiencies	4 (wt.avg.)	67	x	0.102	=	6.8
Sums:				.886 *		54.9

$$H.I. = \frac{\text{Sum of Partial H.I.'s}}{\text{Sum of Applicable Weights}} = \frac{54.9}{.886} = 62.0$$

Relative Strength of Evaluation:

$$\text{Sum of Applicable Weights} \times 100 = 89\ \%$$

*Do not include weights for indicators not used at this site.

DETERMINATION OF HAZARDOUSNESS INDEX

Site Number 10 Date _____

Type _____

Indicator	Date Value	Indicator Value		Weight		Partial H.I.'s
Number of Accidents	1.3 acc/yr	26	x	0.145	=	3.8
Accident Rate	1.86 acc/MEV	39	x	0.199	=	7.8
Accident Severity	11,100 dollars	64	x	0.169	=	10.8
Volume/Capacity Ratio	0.053	18	x	0.073	=	1.3
Sight Distance Ratio	_____(wt.avg.)	67	x	0.066	=	4.4
Traffic Conflict	_____conf/hr.)	–	x	0.053	=	–
Erratic Maneuvers	_____e.m./hr.	–	x	0.061	=	–
Driver Expectancy	2.7 (wt.avg.)	45	x	0.132	=	5.9
Info. System Deficiencies	2.7 (wt.avg.)	45	x	0.102	=	4.6
Sums:				.886*		38.6

$$H.I. = \frac{\text{Sum of Partial H.I.'s}}{\text{Sum of Applicable Weights}} = \frac{38.6}{.886} = 43.6$$

Relative Strength of Evaluation:

$$\text{Sum of Applicable Weights} \times 100 = 89\ \%$$

*Do not include weights for indicators not used at this site.

DETERMINATION OF HAZARDOUSNESS INDEX

Site Number 11 Date

Type

Indicator	Date Value	Indicator Value		Weight		Partial H.I.'s
Number of Accidents	1.8 acc/yr	30	x	0.145	=	4.4
Accident Rate	6.92 acc/MEV	99	x	0.199	=	19.7
Accident Severity	19,070 dollars	62	x	0.169	=	10.5
Volume/Capacity Ratio	0.022	10	x	0.073	=	0.7
Sight Distance Ratio	(wt.avg.)	45	x	0.066	=	3.0
Traffic Conflict	conf/hr.)	-	x	0.053	=	-
Erratic Maneuvers	e.m./hr.	-	x	0.061	=	-
Driver Expectancy	1 (wt.avg.)	17	x	0.132	=	2.2
Info. System Deficiencies	2.4 (wt.avg.)	40	x	0.102	=	4.1
Sums:				.886 *		44.6

$$H.I. = \frac{\text{Sum of Partial H.I.'s}}{\text{Sum of Applicable Weights}} = \frac{44.6}{.886} = 50.3$$

Relative Strength of Evaluation:

$$\text{Sum of Applicable Weights} \times 100 = 89\ \%$$

*Do not include weights for indicators not used at this site.

DETERMINATION OF HAZARDOUSNESS INDEX

Site Number 13 Date

Type

Indicator	Date Value	Indicator Value		Weight		Partial H.I.'s
Number of Accidents	2.0 acc/yr	33	x	0.145	=	4.8
Accident Rate	2.41 acc/MEV	48	x	0.199	=	9.6
Accident Severity	5,715 dollars	50	x	0.169	=	8.5
Volume/Capacity Ratio	0.072	23	x	0.073	=	1.7
Sight Distance Ratio	(wt.avg.)	0	x	0.066	=	0
Traffic Conflict	conf/hr.)	–	x	0.053	=	–
Erratic Maneuvers	e.m./hr.	–	x	0.061	=	–
Driver Expectancy	0.7 (wt.avg.)	12	x	0.132	=	1.6
Info. System Deficiencies	3.5 (wt.avg.)	58	x	0.102	=	5.9
Sums:				.886 *		32.1

$$\text{H.I.} = \frac{\text{Sum of Partial H.I.'s}}{\text{Sum of Applicable Weights}} = \frac{32.1}{.886} = 36.2$$

Relative Strength of Evaluation:

$$\frac{\text{Sum of Applicable Weights}}{100} = 89\ \%$$

*Do not include weights for indicators not used at this site.

DETERMINATION OF HAZARDOUSNESS INDEX

Site Number 14 Date

Type

Indicator	Date Value	Indicator Value		Weight		Partial H.I.'s
Number of Accidents	0 acc/yr	0	x	0.145	=	0
Accident Rate	0 acc/MEV	0	x	0.199	=	0
Accident Severity	0 dollars	0	x	0.169	=	0
Volume/Capacity Ratio	0.049	18	x	0.073	=	1.3
Sight Distance Ratio	(wt.avg.)	20	x	0.066	=	1.3
Traffic Conflict	conf/hr.)	–	x	0.053	=	–
Erratic Maneuvers	e.m./hr.	–	x	0.061	=	–
Driver Expectancy	2.2 (wt.avg.)	37	x	0.132	=	4.9
Info. System Deficiencies	2.2 (wt.avg.)	37	x	0.102	=	3.8
Sums:				.886*		11.3

$$\text{H.I.} = \frac{\text{Sum of Partial H.I.'s}}{\text{Sum of Applicable Weights}} = \frac{11.3}{.886} = 12.8$$

Relative Strength of Evaluation:

$$\text{Sum of Applicable Weights} \times 100 = 89\ \%$$

*Do not include weights for indicators not used at this site.

DETERMINATION OF HAZARDOUSNESS INDEX

Site Number 15 Date _____

Type _____

Indicator	Date Value	Indicator Value		Weight		Partial H.I.'s
Number of Accidents	0.3 acc/yr	8	x	0.145	=	1.2
Accident Rate	0.2 acc/MEV	6	x	0.199	=	1.2
Accident Severity	10,500 dollars	63	x	0.169	=	10.7
Volume/Capacity Ratio	0.056	20	x	0.073	=	1.5
Sight Distance Ratio	_____(wt.avg.)	69	x	0.066	=	4.6
Traffic Conflict	_____conf/hr.)	–	x	0.053	=	–
Erratic Maneuvers	_____e.m./hr.	–	x	0.061	=	–
Driver Expectancy	4.7 (wt.avg.)	77	x	0.132	=	10.2
Info. System Deficiencies	5.0 (wt.avg.)	83	x	0.102	=	8.5
Sums:				.886 *		37.9

$$\text{H.I.} = \frac{\text{Sum of Partial H.I.'s}}{\text{Sum of Applicable Weights}} = \frac{37.9}{.886} = 42.8$$

Relative Strength of Evaluation:

Sum of Applicable Weights x 100 = 89 %

*Do not include weights for indicators not used at this site.